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PLANNING FOR WINTER RECREATION:
A CASE STUDY OF ELK ISLAND NATIONAL PARK

by



W.J. MARSHALL

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF SCIENCE

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THE UNIVERSITY OF ALBERTA
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Date.. *April 24* .. 1980

DEDICATION

To my mom and dad, whose encouragement and support throughout my university years I deeply appreciate.

ABSTRACT

The phenomenal growth in cross country skiing that has occurred and is continuing to occur across Canada has created problems in recreation management. Urban, Provincial and National Parks, some without proper trail facilities, are being overwhelmed by cross country skiers. In order to develop appropriate and viable management programs concerning cross country skiing an adequate data base including information on skier's profile, management concerns, use patterns, use estimates and social carrying capacity must be established. This information is needed to identify what cross country skiers are like, what they do and what they think.

This study involved the development of a data base concerning cross country skiers at Elk Island National Park. Results of the study also provide a number of recommendations for cross country ski trail management at Elk Island National Park.

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CHAPTER I

INTRODUCTION

History and Recent Development

Cross country skiing, also known as ski touring and Nordic skiing, is the original form of skiing and has existed for centuries in Europe. Originally, it was used of necessity, as a swift and efficient means of travel across snow-covered terrain (Rogers, 1977). Although ski touring has been a major activity for hundreds of years, especially in Scandinavia, one of the earliest references to cross country skiing in western Canada is 1900 at Glacier House Lodge in the present Glacier National Park, British Columbia. Despite this early reference the activity remained a minor sport through the 1930's, 40's, 50's and 60's (Parks Canada, 1975a).

Only recently has cross country skiing blossomed in North America, from a relatively unknown sport for purists, to a booming activity that is attracting more and more enthusiasts each year. Lack of information causes difficulty in determining just how large the increase is in participation. There is some evidence to suggest, however, that the increase in participation rate for cross country skiing is quite substantial. For example, in 1970/71 there were 35,000 pairs of cross country skis sold in Canada, five years later in 1974/75, there were 419,000 pairs of cross

country skis sold in Canada (Albertan, 1975). This result indicates an increase in ski sales of over 1000%. A recent study in Banff National Park indicates an increase from 3,500 cross country skiers in 1966/67 to 27,000 in 1973/74 (Parks Canada, 1975a). An even more spectacular increase has been reported for Elk Island National Park. Registration data for the 1972/73 and 1974/75 winter seasons show that the number of cross country skiers using the trails in the Park increased from 1,755 skiers in 1972/73 to 4,306 in 1974/75, a doubling in two years (Parks Canada, 1975b). More recently an article in the Edmonton Journal reported Elk Island as having a higher growth rate, in terms of visitation, than the Mountain Parks --89% (Dodd, 1977). It also noted that due to the phenomenal growth in cross country skiing, the increased number of visits was not only confined to the summer months. For instance, in January 1977 there were 20,611 visits, more than 300% higher than the same month of the previous year--6,080.

Problem Statement

There is little doubt that winter use is changing in Elk Island National Park. A planning team from Parks Canada, responsible for looking at visitor use, discovered that not only was total visitation increasing dramatically, but that winter use was also increasing. January, February and March all showed an increase in the number of visits over previous years. The planning team concluded that the growing

popularity of cross country skiing and other related activities contributed to the increased number of winter visits (Parks Canada, 1975b).

The increased number of cross country skiers at Elk Island National Park has created problems in park management. In particular, increased numbers of cross country skiers have resulted in overcrowding of parking lots and trails. On some weekends cars were reported on both sides of the road at Aspen On-Site Exhibit for almost two kilometers (Kjorlien, 1975). Line-ups of skiers have resulted along some trails, particularly where there are hills.

There are several reasons why winter use at Elk Island National Park has increased and will likely continue to do so. First of all, cross country skiing is becoming more popular, not only in Alberta, but in Canada as a whole. Secondly, the metropolitan region of Edmonton has 600,000 people, is continuing to grow, and is within 40 kilometers of the park. Finally the energy crisis is making travel costs more expensive. People from the Edmonton area will undoubtedly be turning more and more to areas like Elk Island National Park for recreation, rather than making long trips to the Mountain Parks.

Statement of Purpose

If proper decisions are to be made concerning cross country skiing in the Park, one must ascertain the manner in which the increased volume of use affects both the

environment and the skiers' experiences. Such information is essential if the best interests of Albertans and Canadians are to be served.

In order to develop appropriate and viable management programs concerning cross country skiing, an adequate data base, including information on skiers profile, management concerns, use patterns, use estimates and social carrying capacity must be established. Such information is useful in identifying what cross country skiers are like, what they do and what they think.

Although one recognizes that the increased volume of use affects both the environment and the experiences of the users, the scope of this project is limited to the affects of increased use on the skiers. For the purpose of this study, a favourable experience on the trail was assumed to be one characterized by a low number of contacts outside the group travelling together. Another assumption was also made, that the environment along the trail should be as natural as possible, with few signs of human impact (Parks Canada, 1975a).

Objectives

The objectives of this study are as follows:

1. To determine participation in cross country skiing on the trails at Elk Island National Park in terms of:
 - a. total participation for the period from January

9 to March 31, 1978;

- b. distribution of participation;
 - 1) between trails
 - 2) weekday vs. weekend use
- 2. To establish a detailed profile of the user public in terms of:
 - a. demographic characteristics
 - b. family, group, or individual activity
 - c. local or non-local user
 - d. length of stay
 - e. level of skiing experience
 - f. problems encountered on the trail
 - g. ancillary equipment carried on the trip
 - h. primary reasons for going cross country skiing
- 3. To ascertain the social carrying capacity of the trails in the park, by examining:
 - a. the degree of crowding on the trails
 - b. attitudes towards crowding
 - c. opinions of optimal group size for cross country skiing
 - d. opinions towards programs to restrict use
- 4. To identify environmental impacts associated with trail use in the park, by examining:
 - a. damage to the environment as perceived by the visitors
 - b. attitudes towards the environment
- 5. To obtain skiers' opinions on issues concerning

management of the trails.

CHAPTER II

LITERATURE REVIEW

One of the problems faced by researchers involved in studying new phenomena is the lack of data from past research. This is true for cross country skiing, where the sport has risen from obscurity to wide popularity in less than ten years. Only recently, in the last four or five years, has the topic of cross country skiing been dealt with to any degree, with only a few studies published across the U.S. and Canada. However, there is great similarity in the results of these studies. This Chapter presents an overview of the results of these studies.

A fundamental requirement of any winter trail use discussion is the need to determine the characteristics of the participants. The profile of the users is comprised of information gathered on age, sex, place of residence, income, occupation, group characteristics and skiing experience. Evidence from studies across both Canada and the United States suggests that a broad range of people cross country ski, but that the average skier is between 30 and 32 years of age (Paddy, 1975; Parks Canada, 1975a; Irwin, 1973; Dept. Tourism, Parks & Conservation, P.E.I., 1975; Donovan, 1973). These studies also resulted in similar findings in terms of breakdown by sex with approximately 60% of the skiers being male. Again, in a number of studies, Paddy (1975), Parks Canada (1975a) and Irwin (1973), the 12 - 34

age group dominated the activity.

Most skiers live in large urban centres as shown by the Parks Canada study (1975a), where 87% of the respondents lived in Calgary or Edmonton. The Dept. Tourism Parks & Conservation, P.E.I., study (1975), indicated 78% of the respondents lived in Charlottetown or Summerside.

There is also supporting evidence, from at least two studies, that cross country skiers are better educated and hold a greater proportion of professional jobs than average. Irwin (1973) in his survey of the Nordic Foothills Ski Club, found that 42% of the respondents had family incomes greater than \$15,000 and that the average income of the cross country skiing respondent was \$11,300. He also reports that 59% of the skiers surveyed had attended university for some period of time and that 64% were currently employed in professional occupations. Paddy's Ontario ski study (1975) yielded results similar to the above study. Forty-four percent of the respondents had family incomes greater than \$12,000 and the average income of the skiers surveyed was \$14,326. The report also showed that 42% of the cross country skiing respondents had attended university for some period of time.

Irwin's survey (1973) of the Foothills Nordic Ski Club provided evidence to suggest that there are differences between the skiers who have skied for several years and the new enthusiasts. New skiers were discovered to be generally more affluent and not as well educated as the more

experienced long time cross country skiers.

The results of Irwin's survey (1973), the Brookvale study (1975) and the Parks Canada study (1975a) all agree that cross country skiing is very much a family activity. In the Nordic Foothills Survey 46% of the respondents reported skiing with their families (Irwin, 1973). The Brookvale study shows that 32% of the skier groups contacted contained children (Dept. Tourism, Parks & Conservation, P.E.I., 1975). In the Banff study, 24% of the parties surveyed had children among them (Parks Canada, 1975a).

Donovan (1973) reports average group size as 2.2 persons, while the Dept. Tourism, Parks & Conservation, P.E.I. study (1975) and the Parks Canada study (1975a) report 3.4 and 3.6 persons respectively.

The last component of the profile of the user is level of skiing experience, and again the results from surveys across the country are quite similar. The average response to number of years skiing or level of skiing experience was 2.2 years or intermediate. Both Irwin (1973) and the Dept. of Tourism, Parks & Conservation, P.E.I. (1975) report the mean number of years skiing experience as 2.2 years. The Banff study states that 44% of the respondents indicated they were intermediate skiers (Parks Canada, 1975a).

In order to plan for skier use one must know the pattern of use that will probably occur. Thus characteristics of the trip are examined when surveying cross country skiers. In several studies, similar patterns

of use have been found. These findings provide a reliable base for predicting what use patterns will occur.

Evidence from the Parks Canada study (1975a) suggests that cross country skiing is most often a day outing. The study also reported that 90% of the skiers stay less than 7 hours and that the average length of stay was 4 hours. These results imply that management should be concerned with providing trails long enough to accomodate a 4-hour trip with adjoining loops making the circuit a whole day trip for those who wish.

Another important aspect of the skiing experience relates to why people go skiing. In the Parks Canada study (1975a) some of the more common reasons for going cross country skiing were: (1) peace and quiet, (2) scenery, (3) companionship, (4) observe wildlife, (5) to ski per se and (6) enjoyment.

In addition to these, several surveys have obtained information on such management concerns as design parameters, information systems and safety. Irwin's (1973) survey of the Nordic Foothills Ski Club contains some significant criteria for trail design parameters. The most popular responses about trail design requirements were as follows:

1. Ski trails should contain variety in both vegetation and terrain;
2. They should move from an open meadow to a forest or from a closed to an open forest;

3. The trail should climb and descend so that the skier gets a run, then exerts himself, then makes another run.

Another important component of the trail should be open areas for viewing. Trails should be designed with vistas. Skiers mentioned trail difficulty as a necessary parameter of ski trails. This response indicates that trails should have difficult sections, as long as there is room to recover after each difficult section. In addition to these, isolation and absence of people was reported important. These results indicate that trails should be constructed away from main roads and railway tracks. The absence of other people is another component and suggests trails be circular or loop trails, thus preventing skiers from meeting each other while travelling in opposite directions along the trail. Respondents in the Nordic Foothills ski survey also felt there was a need for a shelter of some sort along the long trails or at the heads of shorter trails (Irwin, 1973).

Interestingly enough, the Parks Canada study (1975a), reports most respondents (35%) wanting no improvements made to the trails. However, those that did see room for improvements mentioned the components described in the Foothills Nordic Ski Survey, above (Irwin, 1973).

Both Irwin (1973) and the Parks Canada study (1975a) reflect the same concerns regarding trail information. In the Parks Canada study (1975a) several parties commented on

the need for better trail marking. The Foothills Nordic Ski Club survey resulted in several recommendations for a trail marking system - less used trails and sections of the trails where the route is not obvious should be better marked (Irwin, 1973). In addition to trail signage, several skiers felt that more information should be provided on ski trails (Parks Canada, 1975a).

Several surveys in the Banff and Calgary area have indicated that over 90% of the skiers surveyed carried some emergency supplies (Parks Canada, 1975a; Irwin, 1973). However, these were not always adequate to meet a winter emergency. Some of the articles reported being carried by skiers surveyed were: (1) first aid kit, (2) emergency clothing, (3) emergency food, (4) sunglasses, (5) matches, (6) knife, and (7) spare ski tip.

The Kananaskis Provincial Park Cross Country Ski Plan refers to social carrying capacity as a nebulous, and for cross country skiing, a seldom researched topic (Gardner, 1977). In fact, Winter Season, 1974, Trail Use, Banff National Park (Parks Canada, 1975a) is the only research in western Canada which has dealt with social carrying capacity to any degree. The Parks Canada study (1975a) found 80% of the respondents began to feel crowded if they met 35 people along the trail. The average number of people the respondent could encounter before he began to feel crowded was 17. In terms of actual number of skier contacts, 75% of the respondents reported meeting 20 skiers or less. The average

number of skier contacts was nine. In response to the question "bothered by crowding", 15% of the respondents replied "yes" they were bothered by crowding, and 78% replied "no" they were not bothered by crowding.

The above results indicate that from 6 to over 35 skier contacts constituted crowding. This result exhibits the variation in skiers' perception of the concept. The sense of overcrowding seems to depend on whether the skier contacts are made individually or in one group. That is, meeting 17 skiers in one group may not constitute crowding, whereas meeting 17 individual skiers along the trail may (Gardner, 1977). Another important component is distance. Meeting 17 skiers along a 2 km trail may constitute crowding, whereas meeting 17 skiers along a 20 km trail may not. To determine social carrying capacity, some indication of the number of skier contacts per kilometer is required.

CHAPTER III

METHODOLOGY

This chapter is comprised of four parts including:

1. A description of the study area;
2. A definition of the survey population;
3. An explanation of the survey design, in terms of,
 - a. type of survey,
 - b. survey frame,
 - 1) structure of the questionnaire,
 - c. sample design,
 - 1) sample calculation,
 - 2) survey schedule,
 - 3) weighting methodology,
 - d. field procedures;
4. An explanation of how the data was processed.

Study Area

Elk Island National Park is located 40 kilometers east of Edmonton, Alberta. The park's main entrance is the south gate which is accessed via Highway 16. In addition, there is a north and a west gate. The park comprises 192 square kilometers of varying terrain and vegetation. Elk Island is in the central part of the Alberta plains and is part of the Beaver Hills. The elevation of the park is 700 to 760 meters above sea level and approximately 90 meters above the

general level of the surrounding countryside. The park's rolling landscape is made up of meadows and mixedwood forests of white spruce, white birch, aspen and balsam with a wide variety of shrubs and wild flowers. Small lakes, ponds, sedge/willow marshes and black spruce bogs lie in the depressions (Parks Canada, 1975b).

The climate in the park is continental with average July temperatures in the 21 to 24°C range and average January temperatures in the -9 to -17°C range. Average precipitation is 45-50 centimeters and the average snowfall is between 100 and 150 centimeters (Parks Canada, 1975b).

There are 35 kinds of mammals in the park, including moose, deer, elk and bison as well as over 200 species of birds (Parks Canada, 1977). Recreation facilities in the park include 2 main campgrounds, several day use picnic areas, a 9 hole golf course, swimming and boating facilities as well as hiking, cross country ski and snowshoe trails. There are 43 kilometers of cross country ski trail maintained in the central portion of the park (Parks Canada, 1975b).

Survey Population

The population under consideration in this study consists of all cross country skiers who skied in Elk Island National Park from January 1, 1978 to March 31, 1978 between the hours of approximately 08:00 and 17:00. Further, the population is confined to skiers who entered the park using

vehicles other than buses and who parked in the park itself.

Survey Design

Type of Survey

To enumerate 100% of the cross country skiers in the study area was not feasible, therefore a sample mail-back survey was chosen as an appropriate method of gathering relevant information. Experience with winter season trail users shows that they respond to questionnaires at a high rate (Parks Canada, 1975a).

Survey Frame

The "survey frame" under consideration consisted of one person per vehicle, self-selected to participate in the survey on 14 randomly selected weekdays and 6 randomly selected weekend days, from January 1, 1978 to March 31, 1978. The survey data were weighted upward on the basis of total vehicle information and number of vehicles selected. Sample selection and weighting methodology is described further in the following section.

The Structure of the Questionnaire had to be approved by both Parks Canada and Statistics Canada in order that the study be allowed. After several modifications, the questionnaire design was agreed upon. A cover letter was included to inform potential respondents why the survey was being conducted and who was conducting it. The cover letter also distinguished cross country skiers from other

recreationists. It asked nonskiers to not fill out the questionnaire, but to return it in the self-addressed stamped envelope provided. This information was also used for the purpose of weighting (see Appendix A for a copy of the questionnaire).

The first two questions concerned the respondent's sociodemographic characteristics. After this, the questions were grouped around the following themes:

1. One question concerning the number and ages of people in the surveyed vehicle,
2. Two questions regarding level of skiing experience,
3. One question asking respondents about the group's characteristics,
4. Two questions on trails skied that particular day,
5. Five questions concerning the trip,
6. Two questions on management of the trails,
7. Two questions on interpretive programs and facilities,
8. Five questions related to social carrying capacity,
9. One question concerning safety,
10. One question on reasons for going skiing,
11. One question indicating the number of cross country ski trips made to Elk Island as well as other areas during the 1978 winter season.

The questionnaire was pre-tested by administering it to a group of students and friends. The main purpose here was to determine the clarity of the questionnaire. This

procedure was done in December 1977 so problems could be rectified before actual sampling occurred.

Sample Design

The Calculation of a Sample Size necessary for a given level of accuracy was difficult to compute for the park since winter trail use is not normally recorded. However, using ski registration figures for 1973/74 and 1974/75, the researcher estimated that approximately 6,000 ski parties would be skiing in Elk Island National Park in 1978 during the three months. Of the 6,000 ski parties, the researcher estimated that 4,800 or 80% ski weekend days or public holidays, and 1,200 or 20% ski on weekdays. Therefore, a mean weekend day for the three month period was estimated to have 200 ski parties ($4,800 \text{ parties on weekend days} / 24 \text{ weekend days} = 200 \text{ skiing parties per weekend day}$). On the average weekday, 20 skiing parties would be skiing in the park ($1,200 \text{ parties on weekdays} / 60 \text{ weekdays} = 20 \text{ skiing parties per weekday}$). In order to obtain data with a confidence level of 95% within $\pm 20\%$ range, 20 out of the 83 days within the survey period had to be sampled (Redekop, D.A., 1977).

Sample days were chosen using a Proportion Probability Sampling (PPS) method. Six strata were defined according to month (3) and day type (2). Within these strata a proportional number of weekdays and weekend days were selected for each of the three months the survey was conducted. The survey dates were derived with the use of a

table of random numbers once the strata were defined. Each day in the month was numbered consecutively from 1 to n. If the day appeared in the table of random numbers when read horizontally, left to right, the day was selected for surveying. A schedule of the sample dates selected is shown in Table 1.

Assuming approximately 200 parties per weekend day and 20 parties per weekday, a total of 1,480 questionnaires would be distributed over the three month period. Experience with winter season trail use shows that cross country skiers respond to questionnaires at a high rate (Parks Canada, 1975a). Consequently, if a response rate of 50% was assumed, the sample size would be approximately 700, sufficiently large for analysis.

The researcher discovered that the number of cross country skiers in the park on any day was related directly to weather and snow conditions on the trail; that is, if the weather was mild and the trail conditions good, there could be as many as 700 ski parties in the park. However, if the weather was cold and/or trail conditions poor, the number of skiers in the park would be much less. Due to these fluctuations in level of use, some modifications were made to the survey schedule:

An additional weekend day per month was included in the survey schedule, where only the number of vehicles was recorded. The researcher felt this would give a better estimate of total weekend use. The dates where vehicle

Table 1. Survey Schedule of Sampling Dates Selected

Month	<u>January</u>	<u>February</u>	<u>March</u>	<u>Total Days</u>
MONDAY	23, 30	6	13, 27	5
TUESDAY	17	14		2
WEDNESDAY		1	8	2
THURSDAY		23		1
FRIDAY	20	10	17, 31	4
SATURDAY	14	4, 11	4	4
SUNDAY	<u>15, 29</u>	<u>19</u>	<u>12, 19</u>	<u>5</u>
TOTAL DAYS SAMPLED	7	8	8	23

counts only were made were January 29, February 11 and March 12. The survey days of March 27 and 31 were subsequently cancelled due to snow melt.

The Weighting Methodology used for this study is referred to as the sampling fraction method, suggested by Statistics Canada (Redekop, 1977). There are essentially two reasons for weighting a survey. The first is to reduce bias that may have resulted from interviewing a greater proportion of one group versus another. Say, for example, proportionally more weekends than weekdays were surveyed relative to the known number or proportion of the population of each group. Weighting assists in deflating over-represented groups. The second reason for weighting is to estimate population totals. For example, if one wanted to determine the total number of skier days that occurred at Elk Island, the sample population must be weighted up to the total estimated skier population. Having the estimated population counts in tables, which display the survey results, also has intrinsic value. To say 500 parties (the weighted figure) desired more ski trails in the park has more intrinsic value than saying 50 sample parties desired more trails (Redekop, 1977).

The formula used to establish weights is as follows:

$$W = \frac{\sum_{i=1}^N C_i}{S} \quad (X)$$

Q

where W = Sample Weight

C_i = total of vehicle counts on survey days

N = number of vehicles counted

S = number of survey days

X = number of days in survey period

Q = number of questionnaires returned

This formula is applied twice - once to compute a weekend weight and once to compute a weekday weight for each month. The number of responses stating involvement in activities other than cross country skiing should be subtracted from the figure for questionnaires returned. The easiest method is to calculate it before the data are keypunched. Once calculated, the weight is added to the list of variables which each questionnaire (or record) contains and usually takes the position as the last variable in the record.

Field Procedures

The following procedures were carried out by a single researcher. Perhaps alternative methods would have been more appropriate, but with only one researcher and limited resources, the following techniques were thought to produce the optimum results.

Upon arrival on the morning of a survey day (08:00) the south (main) gate traffic counter was read and recorded. The researcher then made an initial sweep of the park, covering all five parking lots (Tawayik, Shirley Lake, Aspen On-Site Exhibit, golf course, Astotin Lake) as well as the other gates (north and west). At each parking lot an information

poster informing the skiers of the study and asking for their cooperation was posted on the bulletin board. If there were any vehicles in the parking lot, these vehicles were surveyed. At the other gates (north and west) the traffic counter figures were recorded. There were also traffic counters at the two north parking lots, the golf course and Astotin Lake. The counter figures were recorded for each of these parking lots upon arrival.

At each parking lot and along the roadside, the following survey procedures were carried out. A questionnaire, along with a self-addressed, stamped envelope and a trail map enclosed in a zip lock plastic bag were placed under the windshield wiper of parked vehicles. The plastic bag was to keep the contents together and dry in case of falling snow. The researcher felt the trail maps would serve as an incentive to return the questionnaire as well as help the respondent fill out the questionnaire. The self-addressed stamped envelope was provided to make the return of the questionnaire more convenient for the respondent. The last three digits of the license plate for each vehicle were recorded. This procedure was used to keep track of the number of vehicles in the lot and to be able to distinguish any new vehicles in the lot, should skiers decide to remove the questionnaire from under the windshield wiper.

On busy weekend days the researcher was not able to survey the entire population. Therefore, some modifications

to the survey technique were employed. On busy weekend days only 200 questionnaires were distributed. All vehicles were recorded in terms of licence plate digits, but only a sample were surveyed. The number surveyed per parking lot was proportional to previous use. That is, if 50% of the skiers parked at Aspen On-Site Exhibit on the previous weekend days, 100 questionnaires out of the 200 would be distributed at Aspen On-Site Exhibit. The researcher made certain the questionnaires were distributed evenly over the day.

Once all the parking lots and roadside areas had been surveyed, the researcher returned to the starting parking lot (Tawayik) and proceeded as before. Since the parking lots are relatively close, and the amount of time required to survey each parking lot was not large, the assumption that no one would be able to come, ski, and leave before the researcher returned was made. On the average day, a complete circuit of the parking lots and roadside areas could be done in one hour. A schedule of the circuit is presented in Table 2. The circuit was completed a total of 9 times during the average survey day from the hours 08:00 to 17:00. Any vehicle without a questionnaire and not previously recorded was considered a new party and surveyed each consecutive time around.

At the end of the sample day, the traffic counter figures at the two north parking lots (the golf course and Astotin Lake) as well as the counter figures at the three gates were recorded. Due to cold weather conditions and ice

Table 2. Time Schedule

Area		Time	
Tawayik	8:10	9:10	16:10
Shirley Lake	8:20	9:20	16:20
Aspen-on-Site Exhibit	8:30	9:30	16:30
Golf course	8:40	9:40	16:40
Astotin Lake	8:50	9:50	16:50
Roadside	9:00	10:00	17:00

build-up on the roads, problems were encountered with the two traffic counters at the north parking lots (the golf course and Astotin Lake). Consequently, the researcher relied on his own observations of the number of vehicles in each lot rather than the counter figures. The information signs on the bulletin boards at each of the parking lots were also removed before leaving the park.

In addition to the above, the researcher kept a study log for each sample day. It contained notes on such items as weather conditions, trail conditions, and records of unusual events encountered.

Along with the information signs posted on the bulletin boards at each of the trail heads on survey days, the researcher employed other techniques to elicit a high response rate. The various ski clubs and outdoor stores in the metropolitan Edmonton area were notified of the study and asked to co-operate. Without exception, all were interested in the study and were most willing to place an information poster explaining the survey and its purpose in their stores.

Data Analysis

The response data were keypunched, since the questionnaire was quite long and the number of expected returns large. Data analysis was then conducted using the Statistical Package for the Social Sciences (SPSS) at the University of Alberta. The frequencies of responses for each

question were tabulated first. Once these were examined a chi square test and analysis of variance were used to determine if there were any significant differences between variables, eg. distance skied for weekend versus weekday skiers. The chi square test was used when dealing with discrete data and the one way analysis of variance was used for continuous data.

CHAPTER IV

RESULTS AND DISCUSSION

This chapter presents the results of this study. In addition it relates these results to the findings of previous research, points out possible reasons why certain trends exist and expresses the implications of these results on the management of the park.

Response

A total of 1,011 questionnaires were distributed. Of these, 713, or 70% of the questionnaires were returned. Of the 713 questionnaires returned, 61 were responses from non-skiers. Therefore, the number of completed responses by cross country skiers was 652. The high response rate achieved in this study follows the pattern found by Irwin (1973), and Parks Canada (1975a), who obtained response rates of 67% and 72% respectively in their surveys of cross country skiers. (See Appendix B Table 1B Questionnaires Distributed and Responses Received).

Use Estimates

Use estimates are important to Park management. They aid in operational planning such as trail grooming and other forms of maintenance work. They also provide management with base data useful in determining and substantiating the need for the development of trails and facilities.

The findings of this study provide a basis for estimating total trail use at Elk Island National Park. Table 3 presents the record of the number of skiers at Elk Island National Park for the survey period. The number of ski parties was calculated by multiplying the number of questionnaires returned by the appropriate sample weight (see Chapter III p21 for an explanation of sample weight). The number of skiers for each day type and month was determined by multiplying the average party size 2.7 by the number of ski parties. Use estimates were then calculated by summing the number of skiers for each day type and month. Tables 2B, 3B and 4B of Appendix B show how these estimates were calculated.

The total number of skiers using the trails at Elk Island during the 1978 ski season was estimated to be 18,220. Although previous use estimates are difficult to obtain for the park, an estimate of the number of skiers in 1975 using the trails at Elk Island was 4,306 (Parks Canada, 1975b). These results clearly show the large increase in the popularity of cross country skiing and the subsequent impact on facilities at Elk Island National Park.

Trail use at Elk Island is of course much greater on weekend days than on weekdays. February appears to be the most popular month for skiing followed by January and then March. Trail use is however very much dependent on weather and snow conditions. During the 1978 ski season the best weather and snow conditions for cross country skiing

Table 3. Estimated Number of Cross Country Skiers
Elk Island National Park 1978
(at 95% confidence level)

<u>Month and Day Type</u>	<u>Number of Ski Parties</u>	<u>Number of Skiers</u>
January		
weekday	253 ± 7	683 ± 19
weekend	2547 ± 99	6877 ± 267
total	2800 ± 50	7560 ± 135
February		
weekday	196 ± 4	529 ± 11
weekend	2861 ± 476	7725 ± 1285
total	3057 ± 170	8254 ± 459
March		
weekday	231 ± 20	575 ± 54
weekend	678 ± 56	1831 ± 157
total	891 ± 64	2406 ± 173
total weekday	662 ± 4	1788 ± 11
total weekend	6086 ± 132	16432 ± 356
Total	6748 ± 59	18220 ± 159

occurred during February. Consequently trail use was greatest during this month. However in subsequent years trail use may vary.

As trail use at Elk Island is not normally monitored, trail use estimates in future years will be difficult to determine. For this reason use estimates were related to the main gate traffic figures to form a regression equation. The number of cross country skiers in the park in future years may be estimated by entering the traffic count figure for the main gate into the regression equation. Regression equations were calculated for both weekend days and weekdays.

For weekend days the regression equation was:

$$\text{Estimated Number of Weekend Skiers} = 22.25 + 2.3 X$$

The standard error for the above equation was found to be 10.6. Therefore if the number of vehicles entering the park on a weekend day was 300, the staff would be 95% confident that the number of skiers in the park would be somewhere in the interval between 708 and 716.

For week days the regression equation was:

$$\text{Estimated Number of Weekday Skiers} = 1.2 X - 10.6$$

The standard error for the above equation was found to be 16.6. Therefore if the number of vehicles entering the park on a weekday was 40 the staff would be 95% confident that

the number of skiers in the park would be somewhere in the interval between 25 and 49.

Estimates of present and future use are necessary in planning. They help answer the question "how much development is needed". Use estimates are also valuable in justifying expansion of facilities.

Use Pattern

This section illustrates the trail use pattern at Elk Island in terms of the total trail use, and trail use categorized by month, weekend versus weekday and experience level.

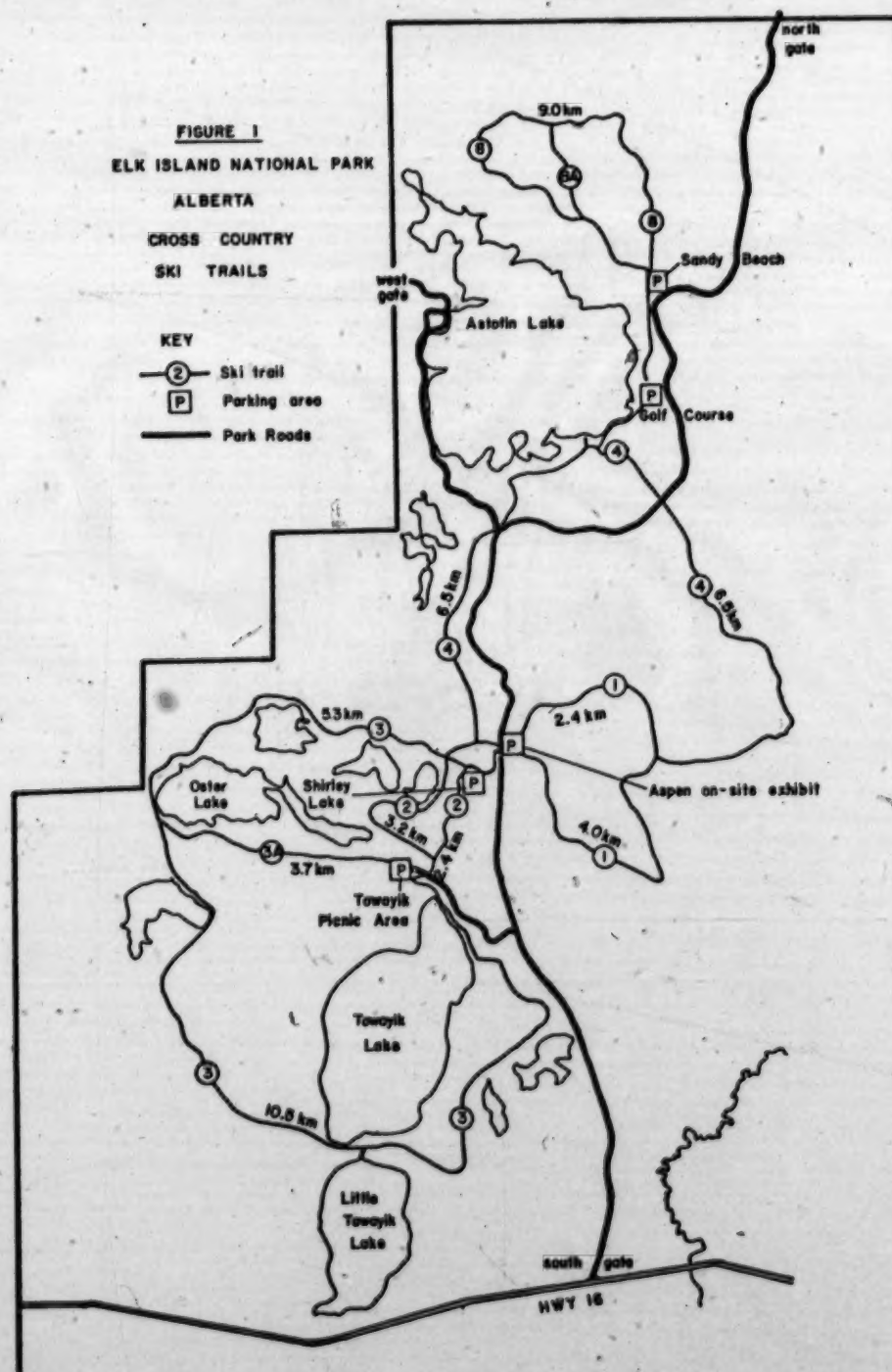
Figure 1 illustrates the trail system at Elk Island. The terrain and forest cover at Elk Island is fairly consistent throughout the whole park and thus the trails do not vary substantially in character except for distance. As can be seen from the map several of the trails are linked together to make a series of loops. For these reasons no one trail is greatly preferred over another at Elk Island.

Trails 1 and 2 which are approximately 5 kilometers each, in length received 14.6% and 13.2% of the total trail use respectively (see Table 5B in Appendix B). These trails, because of their length and terrain characteristics, can be classed as easier trails and are thus generally skied by beginner and novice skiers. Trails 3, 4 and 8 and trail combinations 2, 3A3; 3A, 3 and 1, 4 range from 9 to over 15 kilometers in distance and contain a variety of terrain.

FIGURE 1
ELK ISLAND NATIONAL PARK
ALBERTA
CROSS COUNTRY
SKI TRAILS

KEY

- ② Ski trail
- P Parking area
- Park Roads



These trails receive between 5 and 10% of the total use (see Table 5B in Appendix B). Due to the length and variety in terrain, these trails could be classed as the more difficult trails in the park and thus tend to be skied by the intermediate and advanced skiers.

In looking at trail use patterns on a monthly basis, again the most popular routes tended to be 1, 2, 3, 4, 8 and combinations 2,3A3; 3A,3; 1,4 no matter what the month. (See Table 6B in Appendix B). However, there were some interesting differences in trail use depending on the month. For instance trail 2 and trail combination 2, 3A8 were not used as frequently in the later months while trails 1, 4, 8 and lakes and other were skied more during the latter part of the season.

There are several reasons for these results. The first is that snow conditions became poor during the month of March. The trails became very hard packed and icy. Consequently many skiers took to the lakes and other areas where there were large areas of untracked snow. Secondly, near the end of the season skiers were also more experienced and were tending to go greater distances. For example trails 4 and 8 are approximately 10 kilometers whereas trail 2 is under 5 kilometers. In addition, as the season progressed, skiers became aware of the newer trails in the park, ie 4 and 8, and skied these trails.

Table 7B in Appendix B shows trails skied by weekend versus weekday skiers. This table shows that the trails most

frequently skied were again 1, 2, 3, 4, 8 and combinations 2,3A3; 3A,3; 1,4. Also quite evident is the fact that there is no appreciable difference in trails skied for weekend versus weekday skiers. However, weekday skiers tended to ski fewer combinations of trails compared to their weekend counterparts. Perhaps weekday skiers wanted to ski the main routes for safety reasons since the number of skiers in the park was small.

Similar results were obtained for comparison of trails skied by experience level. Table 8B in Appendix B shows that no matter what the experience level, skier groups tended to ski the same trails ie 1, 2, 3, 4, 8 and 1,4; 2,3A,3 and 3A,3. There were a couple of exceptions however. Beginner and novice skiers skied trail 2 to a greater degree than the more advanced skiers, and the more advanced skiers skied trail 4 and various combinations of trails compared to the less experienced skiers. These results indicate the less experienced skiers skied on the shorter trails while the more advanced skiers skied on the long trails.

Characteristics of the Skiers

One of the fundamental requirements of any winter trail use study is to identify the characteristics of the participants. A profile of the users assists management in planning for trails and facilities that will give maximum enjoyment to the users for whom they are intended. To obtain a profile of the users, information was gathered on the

respondents' age, sex, place of residence and skiing experience.

Demographic Characteristics

In the sample of 640 skiers who reported their age, the mean age was 32 years. Table 4 shows the frequency of these responses. Forty-two percent of the respondents were over 32 years of age and the most often reported age for the respondents was 25 years.

The frequency distribution of respondents in terms of sex indicated that 67% of the respondents were male, 33% female.

A large percentage, 91%, of the skiers were from the metro Edmonton area. The next largest group, 7%, were from areas within a 40 kilometer radius of the city. The last group, representing approximately 2%, were from other areas in Alberta and out of province. (See Table 9B Appendix B).

Experience Level and Motivation

In the sample, 650 respondents indicated their level of skiing experience. Table 5 shows the frequency of these skiers by level of skiing experience. For the purpose of this study the skiing experience categories were defined as follows:

1. Beginner: first year skiing.
2. Novice: 1-2 years skiing experience and/or able to ski on flat to undulating terrain.
3. Intermediate: 2-4 years skiing experience and/or able to ski on moderately steep slopes.

Table 4. Age of Respondents

<u>Age</u>	<u>Frequency</u>	<u>Adjusted Frequency %</u>
14 and under	2	0.3
15 to 19	31	4.8
20 to 24	122	19.1
25 to 34	265	41.4
35 to 44	119	18.6
45 to 64	99	15.5
65 and over	2	0.3
no response	12	
total	652	100.0
mean= 32.41 mode= 25.00 median= 29.47		

Table 5. Level of Skiing Experience

<u>Experience Level</u>	<u>Frequency</u>	<u>Adjusted Frequency %</u>
Beginner	50	7.7
Novice	286	44.0
Intermediate	270	41.5
Advanced	44	6.8
No Response	2	0.0
Total	652	100.0

4. Advanced: 5 years or more skiing experience and/or able to ski all types of terrain (Blue Lake Centre, 1977).

The largest group, consisting of 44% of the sample, were novice skiers. The intermediate skiers represent 41.5% of the sample, while the beginner and advanced group represent 7.7% and 6.8% respectively.

Number of years experience was also asked and the responses to this question coincide directly with the above question on skiing experience level. The number of respondents reporting less than one years skiing experience correspond to the novice and beginner categories while the number of respondents who reported having skied 2-3 years and 4-6 years coincide with the more advanced skier categories.

The most important reason for going skiing as reported by the greatest number of skiers, was that cross country skiing was refreshing mentally. Other reasons stated as being important include: improve physical health, increase appreciation of nature, and observe wildlife. Reasons that were not important include: learn more about self/others, is socially entertaining and opportunity to reflect and think. (See Table 10B in Appendix B).

Skier Preparedness for the Trip

Most skiers carry some items while skiing as indicated in Table 6. Most of those surveyed reported carrying a wax kit, a map, food and drink and extra clothing. Less than one

Table 6. Equipment Carried by Skiers

Category	Frequency	Adjusted Frequency %
Wax Kit	511	78.6
Food and Drink	414	63.7
Map	334	51.4
Clothing	313	48.2
Matches	296	45.5
Sunglasses	264	40.6
Knife	233	35.8
Spare ski tip	182	28.0
First aid kit	122	18.8
Compass	76	11.7
Emergency food	70	10.8
Ski repair kit	56	8.6
Flashlight	42	6.5
Survival equipment	29	4.5
Other	29	4.5
None	32	4.9

half reported carrying other items, some of which included such things as matches, first aid kit, spare ski tip, ski repair kit and survival equipment. Although the trails are not that long nor difficult at Elk Island, these results provide evidence that most skiers are not equipped to meet an emergency should one occur on the trail.

A fundamental requirement of any winter trail use study is to identify the characteristics of the users. The average participant in this study is 32 years of age, male, lives in metro Edmonton and is somewhere between novice and intermediate in skiing experience. These findings coincide closely to the results of other studies carried out on cross country skiers, both in Canada and the United States (Paddy, 1975; Parks Canada, 1975a; Irwin, 1973; Dept. Tourism, Parks and Conservation, P.E.I., 1975; Donovan, 1973). Similar findings were also discovered when the respondents' reasons for going skiing were compared to the results of other studies (Parks Canada, 1975a).

Lastly, as part of the skier profile, the researcher found that there were similarities between studies as to how prepared skiers were for the trip, ie., items carried during the trip (Parks Canada, 1975a; Dept. Tourism, Parks & Conservation, P.E.I., 1975; Irwin, 1973). Most skiers carry some equipment which may include: wax kit, map, extra food and drink and extra clothing. However, most fail to carry such items as: matches, first aid kit, spare ski tip, ski repair kit and survival equipment. These results indicate

that most skiers are not prepared to meet a winter emergency.

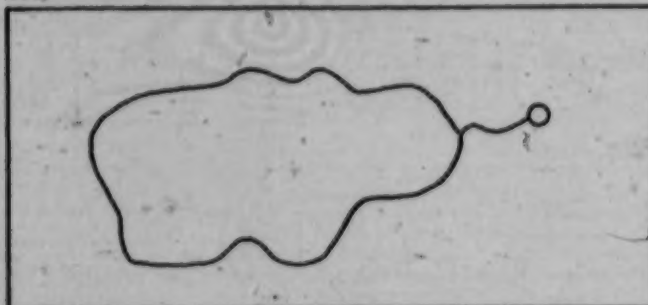
Management is better equipped to answer questions concerning user requirements with an understanding of the user public in terms of his or her socio-demographic characteristics, level of skiing experience, reasons for going skiing and preparedness for the trip. Key questions concerning user requirements include the following: where the trail should be located, how it should be designed and what facilities should be provided in order to give maximum enjoyment to the users for whom it is intended (Parks Canada, 1978a).

The results of this study show that a majority of the trail users are from the Edmonton area which indicates that facilities and trails in the park are used mainly for day use. The best forms of layout for day use ski trails are the stacked loop, the satellite loop and the spoked wheel (see Figure 2) (Parks Canada, 1978a). These provide a variety of routes and can accommodate a wide range of skiers. This is particularly important at Elk Island where skiing experience varies greatly with a majority of the skiers in the novice and intermediate categories.

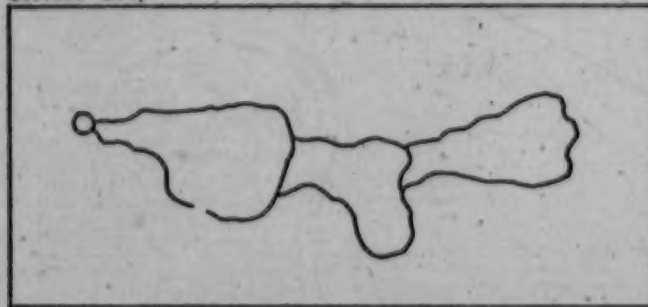
The trails should be laid out such that they can be skied for partial day use, full day use and for return trips, i.e. opportunities for different routes on return visits. Short base loops providing partial day use and use by beginner and novice skiers should be designed with ease

FIGURE 2 FORMS OF CROSS COUNTRY SKI TRAIL LAYOUT
(Source: Parks Canada Trail Manual 1978)

Loop



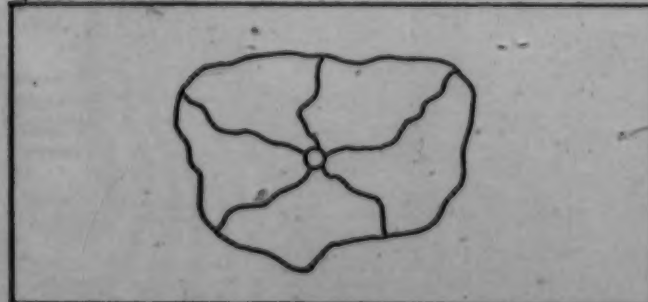
Stacked Loop



Satellite Loop



Spoked Wheel



of movement and safety in mind. Care should be taken to limit grades to 10% on these trails. Protection from strong winds and consideration of hazards that exist in the vicinity of these trails must also be taken into account. The secondary loop trails should be more difficult, with steeper grades, more relief and of a greater distance to satisfy the more experienced skiers.

In addition to functional requirements one must also consider aesthetic factors as an integral part of the trail experience. This factor is a very important aspect of planning since it is the main attraction to a great many users. The success of every trail will depend to some degree upon the quality of the aesthetic experience.

User characteristics, interests and abilities, affect trail use requirements. Many of the skiers at Elk Island listed "increase appreciation of nature" and "observe wildlife" as important reasons for going skiing. Trails to accommodate these users should pass through interesting terrain, be easy to travel and not too long in distance (5 km). Other skiers surveyed reported "improve physical health" and "refreshing mentally" as important reason for going skiing. Trails to satisfy these users should be more difficult with a variety of terrain, steeper grades and be longer in distance (10 km).

Description of the Group

Respondents were asked several questions with regard to their group. A discussion of these variables follows. First, the sample of 1,757 individuals made up 652 parties with an average group size of 2.7 persons.

Table 7 shows that over one third of the trail users were under 25 years of age. Approximately one third of those surveyed were between the ages of 25 and 34. The figures also indicate that cross country skiing is an activity not only pursued by young people. More than one quarter of those surveyed were over 35 years of age.

Approximately one third of the groups surveyed were composed of friends skiing together, another third were families skiing and the remaining groups were people skiing alone or with family and friends or with a club. (See Table 11B in Appendix B).

Several findings were discovered about group description that are common to the findings of previous research. The average group size for the skiing parties at Elk Island was 2.7 persons. Cross country ski studies carried out across Canada and the United States indicate the average group size is between 2.2 and 3.6 persons (Donovan, 1973; Dept. Tourism, Parks & Conservation, P.E.I., 1973; Parks Canada, 1975a).

Also apparent from this study, as well as other studies, is the fact that a broad range of people cross country ski (Parks Canada, 1975a; Irwin, 1973). For instance

Table 7. Frequency of Skiers by Age Category

<u>Age Category in Years</u>	<u>Frequency</u>	<u>Adjusted Frequency %</u>
14 and under	229	13.0
15 - 19	131	7.5
20 - 24	300	17.1
25 - 34	628	35.7
35 - 44	259	14.7
45 - 64	204	11.6
64 and over	6	0.3
no response	1	0.0
Total	1757	100.0

nearly 20% of the parties surveyed at Elk Island, had children as members of the group and at least 20% contained one or more persons between 45 and 64 years of age. As has been the case with many winter trail use studies, the researcher found that cross country skiing at Elk Island is very much a family sport (Irwin, 1973; Parks Canada, 1975a).

Information on group size and composition complements the information gathered on skier's profiles and is thus useful to park management in planning and developing trails and facilities that will maximize the enjoyment of the users. Results of this study indicate that cross country skiing is an activity that attracts people of all ages. These results further emphasize the benefits of a loop trail system which is capable of accommodating a wide range of cross country skiers. Also noted was the fact that a large number of families ski at Elk Island. The trail system should be designed such that the short base loops provide the slower skiers in the family with an easy and safe trip while the secondary loops provide the more experienced skiers in the family with a longer and more difficult route. Consideration should also be given to providing shelters and rest areas along the trails where skiers can stop for lunch. Such rest stops should be strategically located so that they can be used by a maximum number of skiers, i.e. at main trail junctions.

Characteristics of the Trip

This section presents an overview of the skiers activities on the trails in terms of: distance skied, length of stay, wildlife seen along the trail, problems encountered and environmental conditions along the trails.

Table 8 shows the distance skied for each respondent. Approximately one fifth of those surveyed skied less than 5 kilometers. Forty percent skied between 5 and 10 km. and one third of the respondents skied between 10 and 15 kilometers. Only 14% of the respondents skied more than 15 kilometers. The average distance skied was 9.6 kilometers and the most often reported distance skied was 6.4 kilometers.

Nearly two thirds of those surveyed reported skiing on the trails 2-4 hours. Thirty percent reported skiing less than 2 hours. Thus, over 90% of the skiers spend less than 4 hours on the trails. (See Table 12B Appendix B).

Most of the skiers surveyed did not encounter any wildlife while on the trails at Elk Island National Park. Those that did, reported seeing porcupine, bison and moose most often. (See Table 13B Appendix B).

Most skiers surveyed did not encounter any problems while on the trails. Approximately 11% of those surveyed indicated they suffered fatigue along the trail. Eleven percent reported being lost while on the trails. Only 3.7% of the respondents had problems with equipment breakage. (See Table 14B Appendix B).

Almost one half of the respondents saw no damage to the

Table 8. Distance Skied

<u>Distance in km</u>	<u>Frequency</u>	<u>Adjusted Frequency %</u>
1.0 - 5.0	116	18.6
5.1 - 10.0	246	39.1
10.1 - 15.0	192	30.6
15.1 - 20.0	75	12.1
20.1 plus	10	1.9
No response	13	
Total	652	100.0

mean= 9.651 median= 9.017 mode= 6.4

environment along the trails. Nearly one third noticed signs of dogs along the trails and 21.6% noticed litter.

Some of the results of this study are again common to the findings of previous research. Results of this study show that the average cross country skier skies 9.6 kilometers and spends between 2 and 4 hours on the trail. These results are similar to the Banff study where the average length of stay was found to be 4 hours (Parks Canada, 1975a).

Information gathered on the user's behaviour on the trails in terms of distance skied, length of stay, problems encountered, wildlife seen and environmental conditions along the trail is useful to management in determining user requirements. Some key implications to management concerning trail design can be attained from the results of this study. For instance 40% of the skiers surveyed at Elk Island skied between 5 and 10 kilometers and 90% of the skiers spent less than 4 hours on the trails. These results indicate that most of the skiers at Elk Island are day users. The results also show that the base loop trails should be approximately 5 kilometers in length. For full day use the secondary loops should be between 10 and 15 kilometers in length.

The results of this study, in terms of problems encountered along the trails, indicate improvements have to be made in trail signage. Approximately 11% of those surveyed reported suffering from fatigue along the trails and 11% reported being lost. The classification of trails

(Novice, Intermediate, Expert) should be indicated at trail heads or trail junctions. Information such as lengths of trails, layouts of trails and location of facilities should be indicated at the trail heads as well. This improvement in trail information would help eliminate skiers from skiing trails which are beyond their physical capabilities. Trails should also be identified along their routes by names or marker symbols. Trail markers would reduce confusion along the trails and help to prevent skiers from becoming lost.

Protection of the environment is also of major importance. If environmental quality is seriously disturbed the very attributes that have made an area attractive for development in the first place may be lost. Despite the fact that nearly half of those surveyed saw no damage to the environment, over 30% noticed signs of dogs along the trail and 21% noticed litter along the trails. Efforts should be made to ensure trails are not abused or littered by users so that the environmental character of the trail is not significantly changed.

Park Management

This section presents information on skiers' opinions concerning trail construction and maintenance, the number of trails provided in the park, information facilities, the idea of a quota system for the park and interpretive programs and facilities.

Trail Construction and Maintenance

Several surveys of cross country skiers have obtained information on design parameters and maintenance of ski trails (Parks Canada, 1975a; Irwin, 1973). The results of this survey agree with previous research. Table 9 shows that 85% of the skiers surveyed felt the trails in the park were properly constructed and maintained while 8% felt the trails were not. For those who responded "no", most felt the trails required more or better grooming. Other suggestions included one way loop trails, trails with two tracks, improved signage on the trails and the provision of facilities such as benches and shelters along the trails.

The Foothills Nordic Ski Club Survey (Irwin, 1973) and the Banff study (Parks Canada, 1975a) contain some significant findings about trail design, some of which were mentioned by respondents in this study. Ski trails should contain variety in both vegetation and terrain. Trails should climb and descend so that the skier exerts himself, makes a run, then exerts himself again. The trails should also have difficult sections as long as there is ample room to recover. In addition to these, trails should be fairly isolated, away from roads and railway tracks. The absence of other skiers is another component which suggests trails should be one-way loops to prevent skiers from meeting each other while travelling in opposite directions. The provision of shelters along the longer trails (10 - 15 kilometers) and at the trail heads of shorter trails is seen as a necessary

Table 9. Skiers Responses to Questions Concerning Park Management

<u>Category</u>	<u>Frequency</u>	<u>Adjusted Frequency %</u>
<u>Trail Construction and Maintenance</u>		
Adequate	551	85.6
Inadequate	52	8.1
No opinion	41	6.4
No response	8	
Total	652	100.0
<u>Comments</u>		
Grooming	45	54.9
Information	16	19.5
Track	9	11.0
Other	12	14.6
No comment	570	
Total	652	100.0
<u>Number of Trails</u>		
Adequate	432	67.6
Inadequate	104	16.3
No Opinion	103	16.1
No response	13	
Total	652	100.0
<u>Comments</u>		
More trails	82	67.8
More short trails	20	16.5
More long trails	11	9.1
Other	8	6.6
No comment	531	
Total	652	100.0

Table 9 Continued

<u>Category</u>	<u>Frequency</u>	<u>Adjusted Frequency %</u>
<u>Information System</u>		
Adequate	457	70.5
Inadequate	129	19.9
No Opinion	62	9.6
No Response	4	
	-----	-----
Total	652	100.0
<u>Comments</u>		
Trail signs	128	73.6
Maps	29	16.7
Other	17	9.8
No comments	478	
	-----	-----
Total	652	100.0
	-----	-----

component of trail design, by cross country skiers.

Number of Trails

The responses to the second management question "number of trails" are shown in Table 9. Approximately 67% felt the number of trails in the park were adequate, 16% of the respondents replied "no" that there should be more trails in the park. The other 16% replied "no opinion". The large percentage of "no opinion" responses seems to support the fact that many of the skiers are new to the sport and the park and therefore were unable to answer the questions. For those who felt the number of trails were not adequate, most respondents believed there should be more trails. Some felt there should be more short trails (5 kilometers), others thought more long trails (10-15 kilometers) were necessary.

Information Facilities

Past research in the Calgary and Banff areas shows cross country skiers expressing their concerns with regard to cross country ski trail information systems (Irwin, 1973). The findings of this study also coincide directly with previous research. Table 9 shows that 70% of the skier's surveyed felt the facilities supplying information were adequate. Twenty percent believed the information system in the park could be improved. The remainder responded "no opinion". For those who thought the information system was not adequate, most wanted more specific information on trails. Others felt distance markers along the trails would be an improvement. Other suggestions

included trail difficulty signs and more and improved maps.

Judging from these comments the information system at Elk Island is in fact inadequate and could be improved.

Although the number of skiers who reported getting lost was not large there were some. This problem could be avoided with a better information system along the trails, i.e. trail markers and more accurate maps. Likewise, those who suffered from fatigue may not have experienced such problems if more specific trail information such as trail distance and degree of difficulty, was provided at trail heads and trail junctions.

Quota System for the Trails

The question concerning a quota system produced interesting results. Approximately 44% agreed that a quota system would be good for the park if crowding became a major problem, 38% disagreed with the idea and 16% of those surveyed were neutral. (See Table 15B in Appendix B).

Interpretive Programs and Facilities

Interest in interpretive programs and facilities was determined by soliciting skiers' interest in interpretive pamphlets, trail signs and guided trips. Table 10 shows that there is a strong interest in interpretive pamphlets. A total of 60% of the respondents expressed interest in interpretive pamphlets for the trails. Table 10 also shows that there is considerable interest in interpretive trail signs along the trails. Over 63% of the respondents were in favour of such facilities along the trails.

Table 10. Interest in Winter Interpretive Programs & Facilities

<u>Category</u>	<u>Frequency</u>	<u>Adjusted Frequency %</u>
<u>Pamphlets</u>		
Yes	406	66.4
No	157	25.7
No opinion	48	7.9
No response	41	
Total	652	100.0
<u>Trail signs</u>		
Yes	406	66.4
No	198	30.8
No opinion	38	5.9
No response	10	
Total	652	100.0
<u>Guided Trips</u>		
Yes	258	40.0
No	387	60.0
No response	7	
Total	652	100.0
<u>Length of Trip</u>		
1 hour	89	13.8
2-3 hours	150	23.3
3-6 hours	19	2.9
Not interested	387	
No response	7	
Total	652	100.0

The response for guided cross country ski trips with the Park Naturalist was not as great. Table 10 shows that 40% of the respondents were interested in such a program. In terms of the duration of the guided trip, the most popular length was 2-3 hours.

While cross country skiing does not involve the same investment nor sophistication of management as downhill skiing it still requires a significant amount of planning and management. The results of this study indicate, in the view of the users, the trails at Elk Island need to be better maintained. More frequent grooming and poorly marked trails were the main criticisms here. More adequate parking and the provision of shelters and benches on the trails were also suggested. The trail information system needs to be upgraded. This upgrading includes not only the trail markers but maps and descriptions of the trails as well. Some respondents felt more trails were required in the park. A more efficient signage system may enable people to ski where they once would not have, thus reducing the need for new trails. There was also considerable interest in interpretive programs and facilities. Park management should look seriously at implementing interpretive programs on at least some of the trails.

Social Carrying Capacity

As noted previously the success of every trail depends in part upon providing a favourable aesthetic experience.

Overcrowding along a trail can diminish the quality of an aesthetic experience. Therefore, management must provide more facilities and trails or develop programs to restrict use when overcrowding along trails occurs. In order for park management to determine "over crowding" the concept of social carrying capacity must be examined. Social carrying capacity in the context of this report is "the level of recreation use an area can withstand while providing a sustained quality of recreation" (Wagar, 1964). In order to determine the carrying capacity of the trails in the park, several questions were asked pertaining to crowding.

These were:

1. Number of people met along the trail
2. Distribution of skiers along the trail
3. Bothered by crowding
4. Maximum number of people able to meet before feeling crowded
5. Best group size for cross country skiing

Table 11 shows the number of people encountered along the trail as reported by each respondent. The average number of skier contacts was 21. In comparing these results with those of the Banff Study (Parks Canada, 1975a), one can see that the trails at Elk Island were much more crowded than those in Banff. The average number of skier contacts was 9 in the Banff study compared to 21 at Elk Island.

In terms of distribution 44% of those surveyed felt that skiers were generally thinly scattered along the

Table 11. Number of Skiers Met Along the Trail

<u>Number</u>	<u>Frequency</u>	<u>Adjusted Frequency %</u>
10 and under	222	34.6
11-20	183	28.7
21-30	115	18.0
31-40	45	7.0
41-50	45	7.0
51-80	20	2.7
81 plus	12	2.2
no response	10	
Total	652	100.0

mean= 21.067 median= 15.440 mode=20.000

trails. Forty-nine percent, on the other hand, responded that skiers were usually grouped in clusters along the trail. The remaining 2% felt that skiers were concentrated all along the trails. (See Table 16B in Appendix B)

Table 12 shows the responses to the question "bothered by crowding". Only 2% of the skiers surveyed were bothered by crowding, 19% were bothered by crowding sometimes and 79% were not bothered by crowding at all. In the Banff study 15% of the respondents replied they were bothered by crowding and 78% responded "no" they were not bothered by crowding (Parks Canada, 1975a).

With respect to the maximum number of skiers able to meet before feeling crowded, 25% of those surveyed felt crowded if they met between 5 and 15 persons along the trail. Half of the respondents said they felt crowded if they had between 16 and 30 skier contacts on the trail. (See Table 17B in Appendix B). The Parks Canada study (1975a) found that 80% of the respondents began to feel crowded if they met 35 people along the trail.

Sixty-three percent of the skiers surveyed felt the best group size for cross country skiing was between 3 and 5 persons. Thus, the majority of those who ski favour small groups. (See Table 18B in Appendix B)

An interesting result is the variation in the skier's perception of the concept of carrying capacity between the Banff study and this study. In both studies approximately 20% of the respondents reported feeling crowded at least

Table 12. Bothered by Crowding

<u>Category</u>	<u>Frequency</u>	<u>Adjusted Frequency %</u>
Yes	12	2.0
Sometimes	113	18.9
No	472	79.1
Zero answer	51	
No response	4	
	-----	-----
Total	652	100.0

Zero Answer is the category for those who did not
encounter other skiers along the trail

some of the time while on the trails. However the average number of skier contacts on the trails in Banff was about half of what it was at Elk Island. Therefore the skiers at Elk Island are able to accept more skier contacts and are not bothered by crowding to the same degree as the skiers in Banff. There are many variables that may affect the findings of this comparison. One of these is time. The Banff study was carried out in 1974 compared to 1978 for the Elk Island study. The number of cross country skiers has greatly increased over this time interval, therefore skiers may be more used to seeing other skiers than they were before. As well, terrain and trail conditions are very different for the two areas. Despite all the factors that could possibly explain why persons perceive crowding differently the complexity of this concept is still interesting to note.

Comparison of Those Bothered by Crowding versus Those Not

Crowding along the trails at Elk Island is not presently a large problem, with only 2% of the skiers being bothered by crowding and 19% being bothered only sometimes by crowds. However, the researcher felt a comparison of those bothered by crowding versus those not might help further explain the concept of social carrying capacity.

In order to determine whether or not any significant differences exist between those bothered by crowding and those not, both a chi square test and an analysis of variance technique were used. The chi square test was used when dealing with discrete data and was used to determine

whether or not there were any significant differences in the distribution of people met, number of people that could be met before feeling crowded, best group size for cross country skiing, reaction to the idea of a quota system, level of skiing experience and questions on trail condition (litter) for those skiers bothered by crowding compared to those not bothered by crowding. A probability of 0.05 (5%) was chosen as statistically significant.

Analysis of variance, in particular a one way analysis of variance, was used for the continuous data including number of people met along the trail, distance skied and group composition to see if there were any significant differences for those skiers bothered by crowding versus those not. A probability level of .05 (5%) was again chosen as statistically significant.

The results indicate that there were strong differences in those bothered by crowding versus those not for the following variables:

1. Number of people met
2. Distribution of skiers along the trail
3. Best group size for cross country skiing
4. Maximum number of people able to meet before feeling crowded.
5. Level of skiing experience (see Tables 13 and 14).

There is a significant difference in the average number of skier contacts between those who felt crowded and those who did not (See Table 14). Table 15 shows that respondents

Table 13 Comparison of Those Bothered by Crowding
with Those Not Bothered by Crowding
Chi Square Test¹

	<u>Chi Square</u>	<u>DF</u>	<u>Level of Significance</u>
Distribution of people met on trail	64.140	2	0.00
Number of people able to meet	33.518	5	0.00
Best group size for cross country skiing	11.508	4	2.14
Level of skiing experience	19.900	6	0.29
Quota System	6.613	4	15.78
Trail condition litter	3.500	2	17.00

¹Bothered by crowding categories "Yes" and "Sometimes" were collapsed to form the category "Yes" in order to have at least 20% of the Fe cells with frequencies >5.

Table 14 Comparison of Those Bothered by Crowding
with Those Not Bothered by Crowding
Analysis of Variance Test¹

	<u>Standard</u> <u>Deviation</u>	<u>F</u> <u>Ratio</u>	<u>Level of</u> <u>Significance</u>
Number of people met			
Bothered by crowding	24.40	18.70	0.0000
Sometimes	16.40		
No	20.10		
Distance skied			
Bothered by crowding	5.38		
Sometimes	4.72	0.348	0.7061
No	4.62		

¹Bothered by crowding categories "Yes" and "Sometimes" were collapsed to form category "Yes" in order to have at least 20% of the Fe cell with frequencies >5.

Table 15. Number of People Met vs. Bothered by Crowding

<u>Category</u> <u>Bothered by Crowding</u>	<u>Mean Number of People Met</u>
Yes	47.0
Sometimes	31.4
No	21.6

could encounter 21 persons along the trails before feeling crowded. They could have 31 skier contacts and still feel crowded only sometimes. However, if they met 47 persons along the trail, they responded as feeling crowded.

The results indicate that the distribution of people met along the trail differs for those who responded as feeling crowded compared to those who did not. Table 19B in Appendix B shows that those bothered by crowding tended to encounter other skiers along the trail in clusters compared to thinly scattered and in clusters as was reported for those who were not bothered by crowding. Although not large, a greater proportion reported feeling crowded if they met skiers who were concentrated along the trail. Distribution appears to affect whether or not a person feels crowded. Those meeting people thinly scattered along the trail did not feel crowded, whereas those meeting other skiers distributed along the trail in clusters did.

There is no significant difference in the distance skied by those bothered by crowding and those not. The average distance skied was 9.7 kilometers.

As noted previously the concept of social carrying capacity is relatively new to cross country skiing. Both this study and the Banff study (Parks Canada, 1975a) illustrate how complicated the concept is. When all the variables are considered, number of people met, distribution of people along the trail and distance skied, the concept of crowding on the trails at Elk Island can be explained. Over

an average distance of 9.7 kilometers, respondents felt crowded if they met an average of 47 people grouped in clusters along the trail (4.86 people per kilometer). Over the same distance, respondents reported feeling crowded sometimes if they met an average of 31 people grouped in clusters along the trail (3.21 people per kilometer). Over the same distance, 9.7 kilometers, the skiers surveyed reported not being bothered by crowding if they encountered an average of 21 persons grouped in clusters or thinly scattered along the trail, (2.17 people per kilometer).

Some interesting implications for trail management result from these findings. The results illustrate the number of skier contacts per kilometer required to constitute the various levels of crowding. According to the results, trail users can meet 3 persons per kilometer grouped in clusters and still maintain an aesthetic experience. However, once skier contact reaches the 3-5 persons per kilometer level management must step in. The number of skier contacts can be reduced in two ways. Firstly more trails can be constructed dispersing the use over a greater area. In many cases this may cause further problems to management, i.e. increased maintenance and patrolling as well as impacts on the environment. The second method is to impose a quota system allowing only a certain number of skiers on each trail at certain time intervals.

As was discussed previously, crowding on the trails at Elk Island is at present not a large problem. However, in



time trail use may increase to the level where crowding does become a problem. Several suggestions to park management have been discussed here with respect to crowding on the trails.

There are some other interesting comparisons between those bothered by crowding and those not. Results indicate that most respondents felt the best group size for cross country skiing was between 3 and 5 persons regardless of whether or not they were bothered by crowding. Those not bothered by crowding, however tended to favour larger groups, 6 or more, for cross country skiing as compared to those bothered by crowding. The more experienced skiers (intermediate and advanced) tended to be bothered by crowding to a greater degree than the less experienced skiers (beginners and novice).

There is an important management point here. The people in larger groups tended to have less skiing experience and were bothered less by crowds than the smaller groups of experienced skiers. If trails were designated as novice, intermediate, and expert and skiers skied the trails according to their experience level there would be fewer people bothered by crowding along the trails.

Comparison of Weekday with Weekend Skiers

In addition to gathering and examining information on the total skiing population at Elk Island, the researcher felt a comparison of weekend versus weekday skiers would

prove interesting and possibly be important in terms of management of the park. In order to accomplish this, a chi square test and a one-way analysis of variance were performed on the data for the two skier groups.

The results indicate there are significant differences between weekend and weekday skiers for the following variables:

1. demographic characteristics
2. group description
3. characteristics of the trip
4. reasons for going skiing
5. skier preparedness for the trip

The discussion that follows indicates the nature of these differences. Results of the statistical analysis are presented in Tables 20B and 21B in Appendix B.

Characteristics of the Skiers

The characteristics of weekend skiers were found to be significantly different from the characteristics of weekday skiers. In terms of demographic characteristics the only significant difference between weekday and weekend skiers was origin. Most of the skiers originated from Edmonton no matter what the daytype. However, there were more skiers from the centres surrounding the city, other areas of the province and out of province skiing in the park on weekdays compared to weekends.

The chi square test showed a number of significant differences in reasons for going skiing for the two skier

groups. Weekday skiers tended to rank the reasons of: refreshing mentally, solitude, learn about self/others and opportunity to reflect and think as being very important reasons for going skiing, whereas weekend skiers reported the reasons: improve physical health, increase appreciation of nature, and observe wildlife as being important reasons why they went skiing.

There was also a significant difference in items carried by weekend versus weekday skiers. More weekday skiers carried survival equipment compared to weekend skiers.

Description of the Group

Weekend skiing groups differed from weekday skiing groups in group characteristics, group composition and group size. Group characteristics differed at the 0.79 significance level for weekend versus weekday skiers. Weekday skiers tended to ski alone to a greater degree than weekend skiers. Those skiing in groups on weekdays tended to be skiing with friends rather than family, family and friends or clubs, as was common for weekend skiers.

The 35-44 year age group was the only category showing a significant difference in group composition for weekend versus weekday skiers. The people in the 35-44 year age category tended to ski on weekends rather than during the week.

The average group size for weekday parties was smaller than weekend parties. The average group size for weekend ski

parties was 2.8 persons while the average group size for weekday ski parties was 2.2 persons.

Characteristics of the Trip

In terms of experiences on the trip, the following discussion illustrates the differences between weekend and weekday skiers. Recalling Table 3 where the estimated number of weekend skiers at Elk Island was 16,432 and the estimated number of weekday skiers was 1,788 will help explain some of these differences.

Skiers on weekends tended to be bothered by crowding more than skiers on weekdays. Twenty-two percent of the skiers on weekends reported they were bothered by crowding compared to 5% of the weekday skiers.

Results of the survey indicate that skiers tended to be distributed along the trails in a thinly scattered fashion on weekdays, and in clusters on weekends. Sixty-seven percent of the respondents surveyed on weekdays felt skiers were thinly scattered along the trails whereas 56% of the weekend skiers felt the skiers in the park were distributed along the trail in clusters.

As would be expected weekend skiers encountered a greater number of skiers on the trail than did weekday skiers. Weekend skiers met an average of 23 persons along the trail whereas weekday skiers met an average of 4 persons along the trail.

These results are a reflection of the number of skiers in the park on weekdays compared to weekends. In fact one

would suspect weekday skiers to be less tolerant of crowds than weekend skiers since they probably choose to ski weekdays to avoid crowds. This fact is reinforced by the results of reasons for going skiing which was discussed earlier. Those skiing during the week indicated "solitude" was an important reason for going skiing.

Results indicate there was a very significant difference in wildlife observed for weekend skiers as compared to weekday skiers. A greater percentage of weekday skiers encountered wildlife than weekend skiers. Only 31.5% of the weekend skiers surveyed saw some form of wildlife, whereas, 64.1% of the weekday skiers surveyed reported seeing wildlife. In terms of specific species seen, the weekday skiers tended to encounter more moose, birds and small mammals than those skiing on weekends.

There was a significant difference in the skier's perception of the trail conditions for weekend skiers as compared to weekday skiers. Results seem to suggest that weekday skiers were more concerned with the environment than their weekend counterparts. Thus, they were more apt to notice litter and dog droppings along the trail.

Some interesting and useful results were obtained from the above comparison. Weekday skiers tended to ski alone to a greater degree than their weekend counterparts. As well, they met fewer people along the trails as compared to those skiing on weekends. The danger of skiers having problems and not being reported is thus much greater on weekdays than

weekends. There are several ways in which park managers can deal with this problem. The trails could be patrolled on weekdays or perhaps some of the trails could be closed to weekday use. The most acceptable solution, however, would be to implement a registration system for weekday trail use. In this way the park staff knows where skiers are skiing and when they are expected to return.

Comparison of Skiers by Level of Skiing Experience

In addition to the comparison of weekday and weekend skiers, the researcher felt a comparison of skiers by level of skiing experience would produce results applicable to proper trail management. In order to determine if there were any significant differences between skiers according to experience level a chi square test and analysis of variance were performed on the data for the four skier groups.

There are significant differences between skiers according to level of skiing experience for the following variables.

1. Demographic characteristics
2. Group description
3. Characteristics of the trip
4. Reasons for going skiing
5. Skier preparedness
6. Park management
7. Social carrying capacity

A discussion of the nature of these differences follows. Results of the statistical analysis are presented in Tables 22B and 23B in Appendix B.

Characteristics of the Skiers

Some demographic characteristics of the skiers were found to be significantly different depending upon level of skiing experience. The average age of the more experienced skiers was greater than that of the less experienced skiers. Beginner skiers on the average were 28 years of age, novice skiers 32, intermediate skiers 33 and advanced skiers 35.

Results indicate that there was a greater percentage of male skiers in the more experienced skiing categories than females. Seventy-three percent of the intermediate skiers and 84% of the advanced skiers were male.

Results of the study indicate that the less experienced skiers (beginners and novice) ranked "practice" and "entertaining" as very important reasons for going skiing. The more experienced skiers (intermediate and advanced) reported these reasons for going skiing less important. The more experienced skiers reported "opportunity to reflect and think" as a very important reason for going skiing, while the less experienced skiers ranked this reason neutral to not important. Thus, results show that skiers have different reasons for going skiing depending upon their experience levels.

The question asking respondents what items they carried on the trip was intended to illustrate how prepared skiers

were for the trip. The more experienced skiers (intermediate and advanced) reported carrying at least some of the items to a greater degree than the novice and beginner skiers. There were several items carried by the more experienced skiers which were not carried by the less experienced skiers. These included: wax kit, clothing, compass, matches, spare ski tip, ski repair kit, knife and survival equipment.

Description of the Group

Significant differences were found for group characteristics, group composition and group size depending upon the respondents level of skiing experience. The results indicate that no matter what the level of skiing experience, most skiers tended to ski with "Family" or "Friends". For the category "Family and Friends", there seems to be more beginner skiers as compared to the other experience levels. Also, the more experienced skiers tended to ski alone, and not as much with organized clubs, as compared to those with less skiing experience. A large percentage of the beginner and novice skiers skied with friends, whereas the more experienced skiers tended to ski with friends or family to a more or less equal degree.

The comparison of group composition by skiing experience indicates the 20-27 and 64 and over age categories were the only categories showing a significant difference. There were more persons 20-24 years of age in groups of respondents with less skiing experience than those respondents with more skiing experience. Also, there were

more persons 64 years of age and over in the groups of respondents with more skiing experience than for those respondents with less skiing experience.

The average group size was largest for the beginner skiers and smallest for the intermediate category. However, there appears to be little difference in group size for the novice and advanced categories. The average group size for beginner respondents was 3.32, for novice respondents 2.77 for intermediate respondents 2.52 and for advanced respondents 2.75.

Characteristics of the Trip

In terms of experiences on the trip, there were a number of significant differences between the various skiing experience levels. Results show that the distance skied by the respondent increased with skiing experience level. Beginners skied an average distance of 7.2 kilometers, novice skiers skied 8.6 kilometers, intermediates skied 10.9 kilometers and advanced skiers skied 11.1 kilometers.

For trails skied by the groups, the only category where a significant difference was found was lakes. The results show that groups with beginner category respondents skied on the lakes to a greater degree than the other respondents.

In terms of problems encountered along the trails, the only category where a significant difference was found was "fatigue". The skiers who reported having problems with fatigue were beginner, novice or intermediate in terms of skiing experience. Those in the advanced categories reported

having no problems with fatigue.

Park Management

There were significant differences among the various levels of skiing experience for the questions concerning management of the park. Most of the respondents agreed that the number of trails in the park was adequate. There were however, differences in the "no" and "no opinion" categories among experience levels. The less experienced skiers responded "no opinion" to a greater degree than the more experienced skiers. Results also show that the more experienced skiers tended to respond "no", the number of trails in the park was not adequate, compared to the less experienced skiers.

For trail construction and maintenance results indicate that most of the skiers felt the trails were properly constructed and maintained. Again, however, differences occurred in the "no" and "no opinion" categories. The less experienced skiers responded "no opinion" more often than the more experienced skiers. For those who responded "no" the trails were not properly constructed and maintained, most of them were intermediate or advanced skiers.

Responses to the adoption of a quota system for the trails in the park resulted in significant differences among the various skiing experience levels. The less experienced skiers were in favour of a quota system for the trails, while the more experienced skiers were not.

The chi square test indicated there were several

significant differences in demand for interpretive programs and facilities among the various skiing experience levels. The less experienced skiers were more interested in interpretive programs and facilities compared to the more experienced skiers. The results also indicate that the public is more interested in interpretive pamphlets and trail signs and less interested in guided cross country ski trips.

Social Carrying Capacity

The more experienced skiers were bothered by crowding to a greater degree than the less experienced skiers. Twenty-six percent of the intermediate skiers and 20% of the advanced skiers reported being bothered by crowding whereas only 16% of the novice skiers and 18% of the beginner skiers reported being bothered by crowding.

Results from the comparison of maximum number of people able to meet before feeling crowded by respondents level of skiing experience indicates the more advanced skiers will tolerate fewer skier contacts on the trail compared to the less experienced skiers.

In comparing the number of skiers met along the trail versus level of skiing experience, no significant differences were found. The number of skier contacts was 21 regardless of skiing experience. In looking at the comparison of distribution of people met versus skiing experience, again, no significant differences could be

found. Most respondents perceived the distribution of skiers met as being in clusters along the trail. There were however differences in distance skied. The more experienced skiers tended to ski greater distances.

An interesting result is the fact that the more experienced skiers perceived crowding differently as compared to the less experienced skiers. Both groups met essentially the same number of skiers along the trail, 21, with a similar distribution pattern. The more experienced skiers, however, skied greater distances. One can therefore conclude that the less experienced skiers can tolerate a greater number of skiers per kilometer than the more experienced skiers. The less experienced skiers were able to meet between 2 and 3 skiers per kilometer and not be bothered by crowding whereas if the more experienced skiers met 2 persons per kilometer crowding was indicated.

This comparison of skiers by level of skiing experience provides results applicable to trail management. The more experienced skiers tended to be male and older than the less experienced skiers. The intermediate and advanced skiers also skied alone and over a greater distance than the novice and beginner skiers. Experienced skiers were also bothered by crowds to a greater degree than the less experienced skiers. Beginner and novice skiers suffered from fatigue along the trails whereas the more experienced skiers did not.

Part of the park management's responsibility is to

provide a diversity of trails capable of accommodating a wide range of skiers. As mentioned earlier a loop system is most appropriate. In addition the trails should be clearly marked novice, intermediate or expert. This rating system will eliminate several problems occurring in the park. Firstly it should reduce the number of inexperienced skiers skiing on trails which are too difficult for them and thus cut down the number of skiers suffering from fatigue. Secondly if skiers ski the proper trails according to their experience level the number of skiers bothered by crowding will be reduced. This deduction is based on the fact that there will be more beginner and novice skiers on the novice trails and fewer on the advanced trails. Since the less experienced skiers were less bothered by skier contacts than the more experienced skiers the increase in use on novice trails will not have a great impact on the less experienced skiers. However the fewer beginner and novice skiers skiing the advanced trails will reduce the number of experienced skiers being bothered by crowding.

CHAPTER V

RECOMMENDATIONS AND IMPLICATIONS

The new pattern of winter use in Urban, Provincial and National Parks across Canada and specifically Elk Island National Park, has created problems in recreation management. User surveys as well as other statistical information indicate cross country skiing is a major component of this changing pattern of winter recreation. Therefore, in order to develop appropriate and viable management programs concerning cross country skiing, an adequate data base, including information on skier's profile, management concerns, use patterns, use estimates and social carrying capacity, must be established. Such information is useful in identifying what cross country skiers are like, what they do and what they think.

This study involved the development of a data base concerning cross country skiers at Elk Island National Park. Information obtained from the results provides the basis for a number of recommendations for cross country ski trail management at Elk Island.

The number of trails at Elk Island is at present adequate. Crowding on the trails does occur, but only during certain weekends. In the opinions of the skiers, crowding has not yet reached levels where trip experiences are deteriorating. Nor has it reached the level where a quota system for the trails need be established. There is,

however, a need to organize the trail system at Elk Island. The information obtained from this as well as other studies provides excellent guidelines for trail development and organization. Firstly, one way loop trails, of approximately 5-10 kilometers, seem to be most preferred by skiers. In addition to this, secondary loops should be provided to join the whole trail system for those who prefer longer trips. The trails, if possible, should pass through a variety of both terrain and vegetation; to make the trip more interesting. Open areas should also be provided for viewing. Skiers also wanted more difficult sections along the trails as long as there is room to recover. Other suggestions included: areas along the trails for skiers to pass, where two sets of tracks are provided, and better grooming of the trails both before the snow falls and during the ski season.

A number of recommendations on facilities resulted from this study. Although crowding along the trails is not reaching levels of extreme, congestion at parking lots is. There is a definite need for the expansion of parking lots at Elk Island, especially Tawayik and Aspen On-Site Exhibit.

Another recommendation that resulted from this and other studies is the need for more shelters. These facilities could be provided at the trail heads on shorter trails and along the longer trails. In conjunction with trail facilities is the need for an improved trail information system at Elk Island. Suggestions from skiers include: 1) trail descriptions, i.e., length, terrain, etc.,

2) trail markers, 3) distance markers, 4) trail difficulty signs, and 5) easy-to-read maps.

There is an interest in winter interpretation along the trails at Elk Island National Park. The less experienced skiers showed a strong interest in interpretive brochures and trail markings along the trails.

Lastly, the researcher felt that due to insufficient skier preparedness an educational pamphlet for cross country skiers is required. This pamphlet should inform people on how to prepare themselves for a cross country ski trip. Such items as clothing, waxing and safety equipment would be described in the brochure.

Implimentation of these recommendations will require considerable funding, there are as well other implications. One must realize that Elk Island, like other National Parks is:

"dedicated to the people of Canada for their benefit, education and enjoyment ... and shall be maintained and made use of so as to leave it unimpaired for the enjoyment of future generations" (Parks Canada 1978b).

The objective of National Parks is therefore twofold, to preserve the parks resources and to provide the public opportunities to appreciate and experience these resources. The development of an extensive network of ski trails in the park certainly provides an opportunity for people to participate in an outdoor recreational activity and enjoy the park's resources. However is this development compatible with the preservation of the park? This question is very

difficult to answer. There is a tradeoff.

I believe Parks Canada is approaching this tradeoff problem correctly by implementing a zoning system for the park. There are five zones in the system. They range from "Preservation" where facility development is prohibited to "Park Services" where facility development is major (Parks Canada, 1978b).

Elk Island cannot be expected to provide a cross country ski trail system to meet the regional population's demand. The parks main emphasis must be on:

1. the preservation and interpretation of a natural environment.
2. the provision of outdoor recreation opportunities in an uncrowded (low density) environment (Parks Canada, 1978b).

By incorporating the recommendations of this study into the present ski trail system, Elk Island National Park will be making a contribution to meeting the cross country skiing demand in the region. It is the responsibility of other agencies, urban, municipal, private and provincial to contribute as well, in order to meet the demand for cross country skiing in the region.

LITERATURE CITED

Albertan (Nov 13, 1975), Cross-country Boom hits Canadian market, Calgary, Alberta.

Blue Lake Centre (1977), Cross Country Skiing Course Description, Alberta Recreation Parks and Wildlife, Hinton, Alberta.

Department of Tourism, Parks and Conservation (1975), Brookvale User Study, Charlottetown, Prince Edward Island.

Dodd, J. (July 23, 1977), Tourist Boom at Elk Island National Park, The Edmonton Journal, Edmonton, Alberta.

Donovan, G.A. (1973), Vermont Skiing Survey, Economic Research Report No. 73-3, Planning Division, Agency of Development and Community Affairs, Vermont, U.S.A.

Gardner, D. (1977), Kananaskis Provincial Park Cross Country Ski Trail Plan, an unpublished report, Alberta Recreation, Parks and Wildlife, Edmonton, Alberta.

Irwin, D. (1973), Foothills Nordic Ski Club Survey, an unpublished report, Calgary, Alberta.

Kjorlien, M. (1975), Cross Country Skiing, Elk Island National Park, an unpublished report, Elk Island National Park, Alberta.

Paddy, W. (1975), Cross Country Skiing and the Ontario Recreation Survey, Ministry of Culture and Recreation, Sports and Fitness Division, Toronto, Ontario.

Parks Canada (1975a), Winter Season 1974 Trail Use, Banff National Park, Planning Research Division, Western Region, Parks Canada.

Parks Canada (1975b), Elk Island National Park, Visitor Facilities, Visitor Use and Related Resource Capabilities, Planning Research Division, Western Region, Parks Canada.

Parks Canada (1977), Elk Island National Park, Alberta, information brochure, published under the authority of the Hon. Warren Allmand, Minister of Indian and Northern Affairs, Ottawa.

Parks Canada (1978a), Parks Canada Trail Manual, published under the authority of the Hon. J.H. Faulkner, Minister of Indian & Northern Affairs, Ottawa.

Parks Canada (1978b), Elk Island National Park - Management Plan Summary, Park Planning, Western Region, Parks Canada, Calgary, Alberta.

Redekop, D.A. (Nov. 1977), Program Co-Ordination Branch, Socio-Economic Research Division, Ottawa Canada, Working meeting.

Rogers, B. (1977), Cross Country Ski Trails - Construction and Maintenance, Prepared by B. Rogers for the Division of Parks' Winter Workshop, Blue Lake Centre, Alberta.

Statistics Canada (1970), Reporting Procedures and Survey Review Criteria, Ottawa, Ontario.

Wagar, J.A. (1964), The Carrying Capacity of Wildlands for Recreation, Forest Science Monograph 7.

DEPARTMENT OF FOREST SCIENCE

Faculty of Agriculture and Forestry
The University of Alberta



Dear Cross Country Skier:

This winter a study is being undertaken, with the permission of Parks Canada, to examine cross country trail use in Elk Island National Park. We are dependent on your impressions of the trails and facilities in the Park in order to plan for their future use.

Your party is asked to participate in the study. If you or someone in your vehicle has cross country skied today in Elk Island National Park please select one person in your vehicle, over the age of 16, to complete the enclosed questionnaire. You will find in the bag a self-addressed stamped envelope in which to return the questionnaire. A map of the trails in the Park is also provided to assist you in completing the questionnaire. You may keep the map for future visits to the Park.

Your opinion and evaluation of the trails and facilities in the Park are very important in assisting us in planning and managing future winter use of the Park. We sincerely ask for your co-operation in returning the questionnaire as soon as possible.

If no person in your vehicle cross country skied in the Park today, please answer the question below and return the questionnaire and letter to us using the self-addressed stamped envelope. You do not have to complete the questionnaire.

Yours truly,

Bill Marshall,
Winter Recreation Project.

If no one in your vehicle skied at Elk Island National Park today please check below the main activity you were engaged in and return the questionnaire and letter, as soon as possible. Thank you.

Check One
Only

Snowshoeing

Picnicking

Sightseeing

Other please specify _____

TRAIL USER QUESTIONNAIRE

Please place a check or cross in the brackets next to the answer which best describes your own. Try and answer all questions.

For Office 90
Use Only

--	--	--	--

1 — 4

--	--	--	--

5 — 8

1. Where do you live?

- () Metropolitan Edmonton
() Other, please indicate City/Town _____

2. What is your age and sex? _____

3. Please indicate the number of people in your vehicle in each of the following age categories, including yourself:

<u>Age Category</u>	<u># of People</u>
14 and under	()
15 - 19	()
20 - 24	()
25 - 34	()
35 - 44	()
45 - 64	()
64 and over	()

4. In terms of Cross Country Skiing experience place a check in the brackets beside the category which best describes your level of skiing:

- () Beginner (first or second time cross country skiing)
() Novice (skied several times capable of skiing on flat to undulating terrain)
() Intermediate (several years skiing experience able to ski steeper terrain and capable of short overnight trips)
() Advanced (one who is capable of off trail skiing and extended overnight trips)

Do not write
in this column

	9
--	---

	10
	11

	12
	18

	19
--	----

5. With whom did you ski today?

- () Alone
() With friends
() With family
() With family and friends
() With an organized club/group (i.e. school group, outdoor club)

☐ 20

6. Please indicate the number of people in your vehicle who skied the following trails today: (please use the map for reference)

- () Trail #1
() Trail #2
() Trail #3a
() Trail #3
() Trail #4
() Trail #8a
() Trail #8
() Other, please specify _____

☐ 21
☐ 24

7. Please indicate the trails you skied today: _____

☐ 25
☐ 26

8. How many kilometers did you Cross Country Ski today?
(please use the map by adding the distance between nodes)

Please specify here _____

☐ 27

9. How long were you on these trails today?

- () Less than two hours
() Two - four hours
() Four - six hours
() More than six hours

☐ 28

10. While on the trails today did you notice any of the following:

- () Litter
() Fires in undesignated areas
() Dog droppings
() Damage to vegetation
() None of the above

☐ 29
☐ 33

-3-

11. While on the trail today did you see any of the following animals? If so, approximately how many?

() Bison
() Elk
() Moose
() Deer
() Other, please specify _____
() None of the above

34
39

12. Please check the answer beside each statement which best describes your opinion:

	No Opinion	Yes	No (if no please state what might be improved)
The trails I skied were properly con- structed and maintained.	()	()	()

The number of cross country ski trails pro- vided in the Park is ade- quate.	()	()	()
---	-----	-----	-----

40
42

The cross coun- try ski trail information in the Park is adequate.	()	()	()
--	-----	-----	-----

13. Would you be interested in more interpretive programs or facilities?

	Yes	No	No Opinion
Interpretive signs along the trail	()	()	()
Interpretive pamphlet	()	()	()

43
44

14. If crowding was such that quota systems had to be introduced, how would you react?

() Strongly agree	() Disagree
() Agree	() Strongly disagree
() Neutral	

45

For Office
Use Only

15. Would you be interested in guided Cross Country Ski trips, with a Park Naturalist, of the following:

() Not interested at this time
() One hour
() Two - three hours
() Three - six hours

☐ 46

16. Did you encounter any of the following problems on the trails today?

() Equipment breakage
() Frostbite
() Injury
() Fatigue
() Loss of direction
() Conflicts with wildlife
() Other, please specify _____

☐ 47
☐
☐
☐
☐
☐
☐
☐ 53

17. Approximately how many people did you meet on the trail today?

Please specify here _____

☐ 54

18. Were the people you met on the trail today:

() Thinly scattered along the trail
() In clusters but scattered along the trail
() Concentrated all along the trail

☐ 55

19. Were you bothered by crowding on any of the trails today?

() Yes - often
() Sometimes
() No

☐ 56

20. What is the average number of people you could meet on the trail before you began to feel crowded?

() Less than five
() Five - fifteen
() Sixteen - thirty
() Thirty - fifty
() More than fifty
() No opinion

☐ 57

- | | |
|-----|---------------|
| () | One person |
| () | Two people |
| () | Three to five |
| () | Six to nine |
| () | Ten or more |
| () | No opinion |

58

- () Wax Kit
 () Food and drink
 () Extra cold weather clothing
 () Map
 () Compass
 () Matches or fire starter
 () Basic first aid supplies
 () Spare ski tip
 () Ski repair kit
 () Additional food for emergency
 () Sunglasses or goggles
 () Knife
 () Flashlight or candle
 () Other, please specify _____
 () None of the above

59
73

- | | Very
Important | Neutral | Not
Important |
|--|-------------------|---------|------------------|
| Improve physical health | () | () | () |
| Refreshing mentally | () | () | () |
| Is socially entertaining | () | () | () |
| Learn more about cross
country skiing | () | () | () |
| Find solitude, privacy | () | () | () |
| Learn more about self,
others | () | () | () |
| Opportunity to reflect
and think | () | () | () |
| Increase appreciation of
nature | () | () | () |
| Observe wildlife, and
birds | () | () | () |
| Other, please specify | () | () | () |

[illegible]

24. In an average year how many days do you Cross Country Ski in the following areas?

Number of Days	1 - 2	3 - 5	6 - 9	10 Plus
Elk Island National Park	()	()	()	()
Mountain National Parks (e.g. Banff, Jasper, etc.)	()	()	()	()
In Edmonton	()	()	()	()
At Provincial Parks	()	()	()	()
Other, please specify _____	()	()	()	()

84

88

25. When did you start Cross Country Skiing?

- () This year
- () One year ago
- () Two-three years ago
- () Four-six years ago
- () Seven-ten years ago
- () More than ten years ago

89

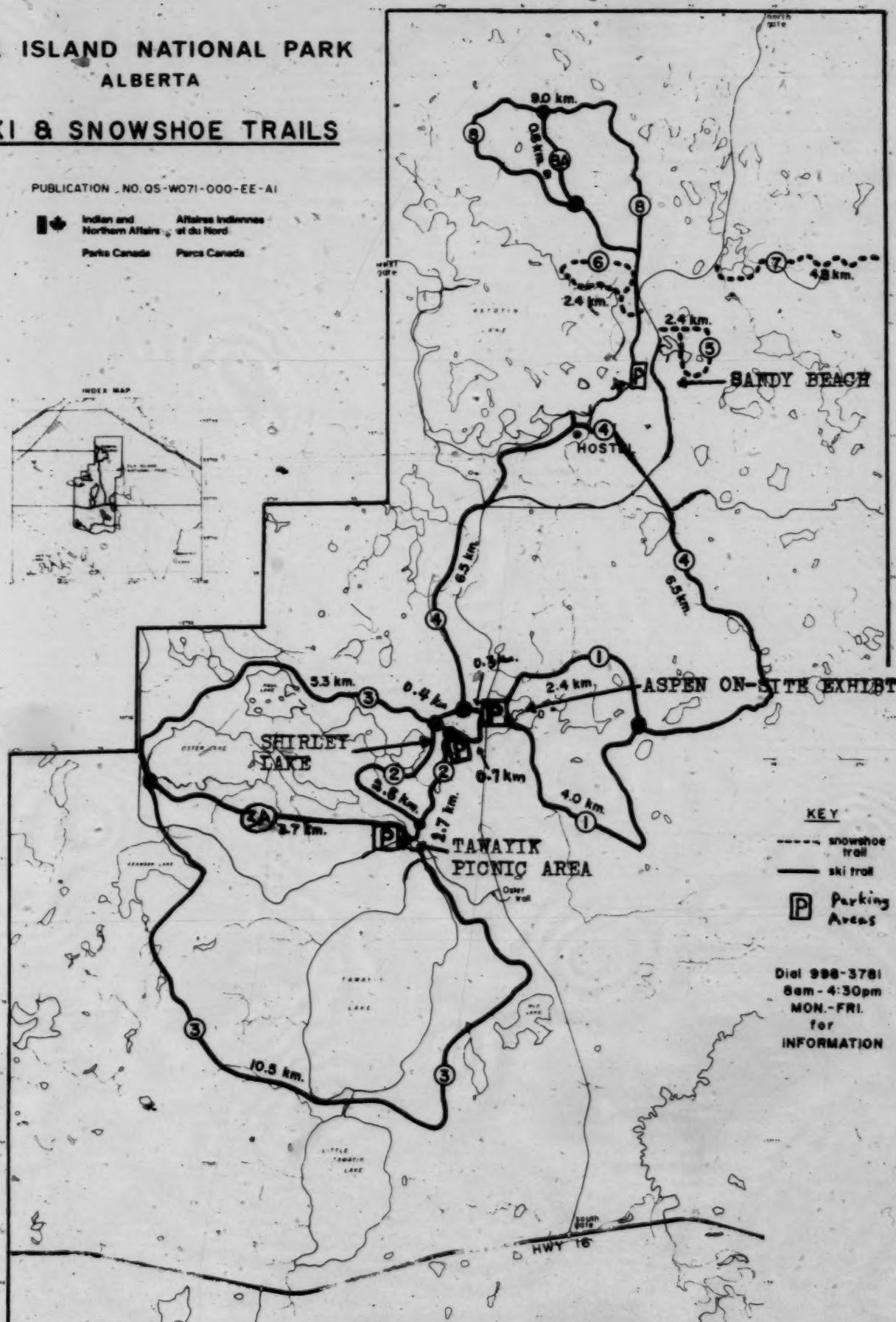
Thank you for your co-operation. Please return this questionnaire in the self-addressed stamped envelope that has been provided.

ELK ISLAND NATIONAL PARK ALBERTA

SKI & SNOWSHOE TRAILS

PUBLICATION NO. QS-W071-000-EE-A1

Indian and Northern Affairs / Affaires Indiennes et du Nord
Parks Canada / Parcs Canada



KEY

--- snowshoe trail
— ski trail
P Parking Areas

Dial 986-3781
8am - 4:30pm
MON.-FRI.
for
INFORMATION

APPENDIX B

Table 1B. QUESTIONNAIRES DISTRIBUTED AND RESPONSES RECEIVED

<u>Date</u>	<u>No. of Questionnaires Distributed</u>	<u>Number Returned</u>	<u>Response Rate</u>
(1978)			
Jan. 14	159	128	81%
Jan. 15	235	183	77%
Jan. 17	5	5	100%
Jan. 20	15	14	93%
Jan. 23	19	18	95%
Jan. 30	7	6	86%
Total for month	440	354	80%
Feb. 1	2	1	50%
Feb. 4	111	74	66%
Feb. 6	11	8	73%
Feb. 10	15	10	67%
Feb. 14	12	8	67%
Feb. 19	200	138	69%
Feb. 23	7	2	29%
Total for month	358	241	67%
March 4	108	65	60%
March 8	26	16	62%
March 13	3	1	33%
March 17	9	1	11%
March 19	67	35	53%
Total for month	213	118	56%
Total for sampling period	1,011	713	70%

Table 2B. Calculation of Weights

Survey Dates	Survey Days (S)	Vehicle Counts (C)	Questionnaires Returned	Other Responses (Q)	Total
Jan. 14	1	205	128	-	128
Jan. 15	1	347	183	5	178
Jan. 29	1	297	-	-	-
total	3	849			306

(# weekend days in survey period = 9)

$$W = \frac{\sum_{i=1}^N \frac{C_i}{S}}{Q} = \frac{849}{300} = 8.3235$$

$$W = 8.3235$$

Jan. 17	1	5	5	-	5
Jan. 20	1	15	15	4	11
Jan. 23	1	19	18	-	18
Jan. 30	1	7	6	1	5
total	4	46			39

(# weekdays in survey period = 22)

$$W = 6.4782$$

Feb. 4	1	118	74	8	66
Feb. 11	1	187	-	-	-
Feb. 19	1	768	138	8	130
total	3	1073			196

(# weekend days in survey period = 8)

Table 2B Continued

$$W = \underline{14.5986}$$

Feb. 1	1	2	1	2	1
Feb. 6	1	12	8	2	6
Feb. 10	1	15	10		10
Feb. 14	1	13	8	1	7
Feb. 23	1	7	2		2
	-----	-----	-----	-----	-----
total	5	49			26

(# weekdays in survey period = 20)

$$W = \underline{7.5385}$$

Mar. 4	1	111	65	9	56
MAR. 12	1	161		-	-
Mar. 19	1	67	36	19	16
	-----	-----	-----	-----	-----
total	3	339			72

(# weekend days in survey period = 6)

$$W = \underline{9.4167}$$

Mar. 8	1	28	16	4	12
Mar. 13	1	3	1	-	1
Mar. 17	1	9	1	1	0
	-----	-----	-----	-----	-----
total	3	40			13

(# weekdays in survey period = 16)

$$W = \underline{16.4103}$$

Table 3B. Weights

<u>Month</u>	<u>Weekend Weight</u>	<u>Weekday Weight</u>
January	8.3235	6.4872
February	14.5986	7.5385
March	9.4167	16.4103

Table 4B. Calculation of Use Estimates

Month	#Questionnaires Returned by Skiers	Weight	Number of Parties ¹	Average Group Size	Number of. Skiers ²
January					
weekend	306	x 8.3235 =	2547	x 2.7 =	6877
weekday	39	x 6.4872 =	253	x 2.7 =	683
Total			2800	x 2.7 =	7560
February					
weekend	196	x 14.5986 =	2861	x 2.7 =	7725
weekday	26	x 7.5386 =	196	x 2.7 =	529
Total			3057	x 2.7 =	8254
March					
weekend	72	x 9.4167 =	678	x 2.7 =	1831
weekday	13	x 16.4103 =	213	x 2.7 =	575
Total			891	x 2.7 =	2406
total					
weekend	574		6086		16432
total					
weekday	78		662		1788
Total	652		6748		18220

¹in order to expand the survey results to population estimates individual weights were calculated and multiplied by the number of questionnaires returned

²in order to determine the total number of skiers the number of parties for each specific day type for each month was multiplied by the average group size (2.7).

e.g. Jan. #Parties #Skiers
weekend 2542 x 2.7 = 6877

Table 5B. Trails Skied by the Respondent

<u>Trail</u>	<u>Frequency</u>	<u>Frequency %</u>
no response	4	0.0
1	95	14.6
1, 2	21	3.2
1, 2, 3A 3	1	0.2
1, 2, 3	1	0.2
1, 2, 4	3	0.5
1, 3A	1	0.2
1, 3	3	0.5
1, 3, other	1	0.2
1, 4	36	5.5
2	86	13.2
2, 3A	11	1.7
2, 3A, 3	69	10.6
2, 3	25	3.8
2, 3, 8, other	1	0.2
2, 4	2	0.3
2, 4, 8	1	0.2
2, 8	1	0.2
2, other	2	0.3
3A	25	3.8
3A, 3	50	7.7
3A, other	2	0.3
3	40	6.1
3, 4, 8	1	0.2
3, other	2	0.3
4	61	9.4
4, 8A	1	0.2
4, 8A, 8	1	0.2
4, 8A, 8	1	0.2
4, 8	1	0.2
4, Lakes	1	0.2
4, other	2	0.3
8A	4	0.6
8A, 8	12	1.8
8	43	6.6
8, other	13	2.0
Lakes	5	0.8
Other	24	3.7
Total	652	100.0

Table 6B. Trail Use by Month

Trail	January		February		March	
	Freq.	Adj. Freq. %	Freq.	Adj. Freq. %	Freq.	Adj. Freq. %
no response			2		2	
1	45	13.0	34	15.5	16	19.3
1, 2	10	2.9	9	4.1	2	2.4
1, 2, 3A 3	1	0.3				
1, 2, 3	1	0.3				
1, 2, 4	2	0.6	1	0.5		
1, 3A					1	1.2
1, 3	2	0.6	1	0.5		
1, 3, other					1	1.2
1, 4	23	6.7	6	2.7	7	8.4
2	55	15.9	26	11.7	5	6.0
2, 3A	6	1.7	5	2.3		
2, 3A, 3	42	12.2	21	9.5	6	7.2
2, 3	12	3.5	10	4.5	3	3.6
2, 3, 8, other			1	0.5		
2, 4	1	0.3			1	1.2
2, 4, 8			1	0.5		
2, 8	1	0.3				
2, other	2	0.6				
3A	11	3.2	11	5.0	3	3.6
3A, 3	30	8.7	14	6.4	6	7.2
3A, other	2	0.6				
3	25	7.2	10	4.5	5	6.0
3, 4, 8					1	1.2
3, other	1	0.3	1	0.5		
4	31	9.0	20	9.1	10	12.0
4, 8A			1	0.5		
4, 8A, 8			1	0.5		
4, 8	1	0.3				
4, Lakes					1	1.2
4, other			1	0.5		
8A	3	0.9			1	1.2
8A, 8	7	2.0	5	2.3		
8	13	3.8	24	10.9	6	7.2
8, other	7	2.0	6	2.7		
Lakes	1	0.3	3	1.4	1	1.2
Other	10	2.9	8	3.6	6	7.2
Total	345	100.0	222	100.0	85	100.0

Table 7B. Trails Skied by Weekend vs Weekday Skiers

Trail	<u>Weekend</u>		<u>Weekday</u>	
	<u>Freq.</u>	<u>Adj. Freq. %</u>	<u>Freq.</u>	<u>Adj. Freq. %</u>
no response	4			
1	83	14.5	12	15.4
1, 2	18	3.1	3	3.8
1, 2, 3A 3	1	0.2		
1, 2, 3	1	0.2		
1, 2, 4	2	0.3	1	1.3
1, 3A	1	0.2		
1, 3	3	0.5		
1, 3, other	1	0.2		
1, 4	33	5.7	3	3.8
2	74	12.9	12	15.4
2, 3A	10	1.7	1	1.3
2, 3A, 3	58	10.1	11	14.1
2, 3	21	3.7	4	5.1
2, 3, 8, other			1	1.3
2, 4	2	0.3		
2, 4, 8	1	0.2		
2, 8	1	0.2		
2, other	2	0.3		
3A	24	4.2	1	1.3
3A, 3	46	8.0	4	5.1
3A, other	1	0.2	1	1.3
3	34	5.9	6	7.7
3, 4, 8	1	0.2		
3, other	2	0.3		
4	54	9.4	7	9.0
4, 8A	1	0.2		
4, 8A, 8	1	0.2		
4, 8	1	0.2		
4, Lakes	1	0.2		
4, other	2	0.3		
8A	4	0.7		
8A, 8	11	1.9	1	1.3
8	39	6.8	4	5.1
8, other	11	1.9	2	2.6
Lakes	3	0.5	2	2.6
Other	22	3.8	2	2.6
Total	574	100.0	78	100.0

Table 88. Trail Use by Experience Level

Trail	Beginner		Novice		Intermediate		Advanced	
	Freq.	Freq. %	Freq.	Freq. %	Freq.	Freq. %	Freq.	Freq. %
no response			3		1			
1	6	12.0	49	17.3	33	12.3	7	15.9
1. 2	1	2.0	12	4.2	6	2.2	2	4.5
1. 2. 3A. 3					1	0.4		
1. 2. 3							1	2.3
1. 2. 4			1	0.4	1	0.4		
1. 3A	1	2.0						
1. 3					2	0.7	1	2.3
1. 3. other	1	2.0						
1. 4			11	3.8	22	8.2	3	6.8
2	9	18.0	47	16.6	27	10.0	3	6.8
2. 3A			4	1.4	7	2.6		
2. 3A. 3	4	8.0	27	9.5	34	12.6	4	9.1
2. 3	3	6.0	11	3.8	8	3.0	3	6.8
2. 3. 8. other					1	0.4		
2. 4			1	0.4	1	0.4		
2. 4. 8			1	0.4				
2. 8					1	0.4		
2. other			1	0.4	1	0.4		
3A	4	8.0	15	5.0	6	2.0	4	9.1
3A. 3	3	6.0	16	6.0	27	10.0		
3A. other	3	6.0	2	1.0				
3			19	7.0	14	5.0	4	9.1
3. 4. 8					1	0.4		
3. other	4	8.0	2	1.0				
4			21	7.0	30	11.0	6	13.6
4. 8A					1	0.4		
4. 8A. 8					1	0.4		
4. 8					1	0.4		
4. Lakes					1	0.4		
4. other								
8A	1	2.0	1	0.4				
8A. 8	1	2.0	2	1.0	1	0.4		
8	1	2.0	3	1.0	8	3.0	2	4.5
8. other	3	6.0	16	6.0	21	8.0	2	4.5
Lakes	2	4.0	1	2.0	5	2.0	1	2.3
Other	3	6.0	6	5.0	1	2.0	1	2.3
Total	50	100.0	286	100.0	270	100.0	44	100.0

Table 9B. Origin of Skiers Surveyed

<u>Origin</u>	<u>Frequency</u>	<u>Adjusted Frequency %</u>
Metro-Edmonton ¹	593	91.1
Metro Area ²	48	7.4
Other Alberta	4	0.6
Other	6	0.9
no response	1	
Total	652	100.0

¹Metro Edmonton includes Edmonton, St. Albert, and Sherwood Park.

²Metro area includes the area surrounding the city of Edmonton, i.e., within 40 kilometers of the city limits.

Table 108. Reasons for Going Skiing

Category	Very Important		Neutral		Not Important		No Response		Total
	Freq.	Adj. %	Freq.	Adj. %	Freq.	Adj. %	Freq.	%	
Health	583	84.2	93	14.7	7	1.1	19	2.9	100.0
Refreshing	538	88.1	66	10.1	7	1.1	41	6.3	100.0
Entertaining	211	37.8	212	38.0	135	24.2	94	14.4	100.0
Practice	287	50.4	204	35.9	78	13.7	83	12.7	100.0
Solitude	273	49.7	368	31.0	74	13.5	103	15.8	100.0
Learn about self/others	106	20.3	257	49.2	159	30.5	130	19.9	100.0
Think	235	42.8	221	40.3	93	16.9	103	15.8	100.0
Nature	448	68.7	129	19.8	15	2.5	60	9.2	100.0
Wildlife	333	59.3	203	36.1	26	4.6	90	13.8	100.0
Other ¹	57	87.7	6	9.2	2	3.1	587	90.0	100.0

¹Includes enjoy, get away, etc.

Table 11B. Characteristics of the Group

<u>Group Characteristics</u>	<u>Frequency</u>	<u>Adjusted Frequency %</u>
Alone	74	11.4
Friends	243	37.4
Family	218	33.8
Family and Friends	93	14.3
Club	21	3.2
No Response	3	0.0
Total	652	100.0

Table 12B. Length of Stay on the Trails

	<u>Frequency</u>	<u>Adjusted Frequency %</u>
less than 2 hours	196	30.2
2 - 4 hours	403	62.1
4 - 6 hours	47	7.2
more than 6 hours	3	0.5
no response	3	
	-----	-----
total	652	100.0
	-----	-----

Table 13B. Percentage of 652 Parties Reporting at Least
One Observation of a Particular Animal

<u>Wildlife</u>	<u>Percentage of Parties Reporting</u>
Bison	9.7
Elk	3.5
Moose	8.9
Deer	2.9
Porcupine	12.2
Birds	5.5
Small Mammals	6.1
none	64.4
total	100.0

Table 14B. Percentage of 652 Parties Reporting Having
Encountered One or More of the Following
Problems While on the Trail

<u>Problem</u>	<u>Frequency</u>	<u>Adjusted Frequency %</u>
Equipment Break	24	3.7
Frostbite	6	0.9
Injury	9	1.4
Fatigue	70	10.8
Lost	71	10.9
With wildlife	2	0.3
Dogs	11	1.7
Nonskiers	4	0.6
Other skiers	11	1.7
Trail conditions	19	2.9
None	422	65.1
No response	3	0.0
Total	652	100.0

Table 15B. Quota System

<u>Category</u>	<u>Frequency</u>	Adjusted <u>Frequency %</u>
Strongly agree	66	10.3
Agree	222	34.6
Neutral	104	16.2
Disagree	145	22.6
Strongly disagree	105	16.4
No response	10	
Total	652	100.0

Table 16B. Distribution of Skiers Along the Trail

<u>Category</u>	<u>Frequency</u>	<u>Adjusted Frequency %</u>
Thinly Scattered	264	44.5
In clusters	319	53.8
Concentrated	10	1.7
Zero answer	51	
No response	8	
Total	652	100.0

'zero answer is the category for respondents who did not encounter other skiers along the trail.

Table 17B. Maximum Number of People Able to Meet
Before Feeling Crowded

<u>Category</u>	<u>Frequency</u>	Adjusted <u>Frequency %</u>
Less than 5	21	3.3
5 - 15	158	24.8
16 - 30	187	29.4
30 - 50	134	21.0
More than 50	85	13.3
No opinion	52	8.2
No response	15	
Total	652	100.0

Table 18B. Best Group Size for Cross Country Skiing

<u>Category</u>	<u>Frequency</u>	<u>Adjusted Frequency %</u>
1	2	0.3
2	109	16.8
3 - 5	411	63.5
6 - 9	69	10.7
10 plus	7	1.1
No opinion	49	7.6
No response	5	
Total	652	100.0

Table 19B. Distribution of People Met
vs. Bothered by Crowding
Frequency %

Bothered by Crowding	Thinly Scattered	In Clusters	Concentrated	Total %
Yes	11.5	85.2	3.3	100.0
No	51.7	47.3	0.9	100.0

Table 20B. Differences Between Weekend and Weekday Skiers¹. Chi Square Test

<u>Variable</u>	<u>Chi Square</u>	<u>Degrees of Freedom</u>	<u>Level of Significance</u>
Origin	18.965	3	0.03
Group characteristics	13.829	4	0.79
Reasons for Going Skiing			
Refreshing	9.169	2	1.02
Solitude	6.431	2	4.01
Learn about self			
/others	7.599	2	2.24
Opportunity to think	17.652	2	0.01
Other	12.981	2	0.15
Distribution of skiers	13.394	2	0.12
Bothered by crowding	5.857	1	1.55
Trail conditions (litter)	3.803	1	5.12
Items Carried			
Survival equipment	5.523	1	1.88
Wildlife observed			
None	30.560	2	0.00

¹It should be noted that the table represents those variables that were statistically different at the 5% level for weekend versus weekday skiers. The categories of variables--origin, length of stay, and bothered by crowding--were collapsed in order to meet the requirements of the chi square test (at least 80% of the expected frequency cells with frequencies of more than 5).

Table 21B. Differences Between Weekend and Weekday Skiers
Analysis of Variance Test

Variable	Mean	Standard Deviation ¹	F Ratio	Level of Significance
No. of people met				
weekend	23.4840	20.2206	74.148	0.0000
weekday	3.5897	7.1085		
Group Composition ²				
35 - 44 weekend	0.4241	0.7888	5.732	0.0169
weekday	0.2051	0.4660		
Wildlife Observed:				
Moose weekend	0.1259	0.5535	17.413	0.0000
weekday	0.4487	1.0889		
Birds weekend	0.0594	0.3295	5.207	0.2300
weekday	0.1538	0.4287		
Small mammals				
weekend	0.0542	0.2416	24.515	0.0000
weekday	0.2564	0.7286		

¹It should be noted that this table represents those variables that were statistically different at the 5% level for weekend versus weekday skiers.

²For group composition, the mean number of persons reporting in each age category were compared in terms of weekend versus weekday using analysis of variance techniques. These tests were performed in order to determine if there were any significant differences in group composition between weekend and weekday skiing parties. The age category 35-44 was the only category where a significant difference was found between weekend and weekday skiers.

Table 22B. Comparison of Responses by Skiing Experience¹,
Chi Square Test

<u>Variable</u>	<u>Chi Square</u>	<u>Degree of Freedom</u>	<u>% Signif.</u>
Sex	20.08	3	0.02
Group characteristics	33.91	12	0.07
Adequacy of no. of trails	13.70	6	3.31
Interpretive signs	12.43	6	5.30
Interpretive pamphlets	21.95	6	0.12
Guided X/C ski trips	19.45	9	2.16
Quota system	33.91	12	0.07
Problems			
Fatigue	18.07	3	0.04
Bothered by crowding	17.04	6	0.91
Maximum number of people able to meet	27.90	15	2.22
Items carried			
Wax kit	13.56	3	0.36
Clothing	12.08	3	0.71
Compass	9.45	3	2.38
Matches	12.65	3	5.50
Spare ski tip	63.09	3	0.00
Knife	14.54	3	0.23
Reasons for Skiing			
Entertaining	13.22	6	3.96
Practice	44.12	6	0.00
Think	12.41	6	5.34

¹It should be noted that the above Table represents those variables that are statistically different at the 5% level for respondents based on level of skiing experience. The categories of variables origin, length of stay, bothered by crowding, and best group size for cross country skiing were collapsed to meet the requirements of having at least 80% of the expected frequency cells with frequencies of more than 5.

Table 23B. Differences in Responses Based on Skiing Experience¹, Analysis of Variance Test

<u>Variable</u>	<u>Mean</u>	<u>Standard Deviation</u>	<u>F Ratio</u>	<u>F Probability</u>
Age				
Beginner	27.880	7.580	4.67	0.0031
Novice	31.950	10.040		
Intermediate	33.230	10.760		
Advanced	34.740	10.460		
Group Composition ²				
20 - 24				
Beginner	1.000	1.940	7.11	0.0010
Novice	0.480	0.830		
Intermediate	0.380	0.750		
Advanced	0.270	0.620		
64 and over				
Beginner	0.000	0.000	2.93	0.0330
Novice	0.007	0.084		
Intermediate	0.000	0.000		
Advanced	0.046	0.300		
Trails Skied by Group - Lakes				
Beginner	0.120	0.630	3.14	0.025
Novice	0.007	0.120		
Intermediate	0.019	0.220		
Advanced	0.230	0.150		
Distance Skied (km)				
Beginner	7.210	3.660	18.88	0.000
Novice	8.570	4.300		
Intermediate	10.920	4.610		
Advanced	11.080	5.290		

¹It should be noted that this table represents those variables that were statistically significant at the 5% level for the various skiing experience levels.

²For group composition, the mean number of persons reported in each age category were compared in terms of the respondent's level of skiing experience, using analysis of variance techniques. These tests were performed in order to determine if there were any significant differences in group composition among the levels of skiing experience. The age categories 20 - 24 and 64 and over were the only categories where significant differences were found.